Federation of Rhodesia and Nyasaland

REPORT

of the

SECRETARY

to the

FEDERAL MINISTRY OF AGRICULTURE

For the Year Ended 30th September, 1957

Presented to the Federal Assembly
1958

Price 10/6 per copy

PRINTED BY THE GOVERNMENT PRINTER, SALISBURY
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G.P. & S. 2181—921—26-6-58.

COMMONWEALTH

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REPORT OF THE SECRETARY TO THE FEDERAL MINISTRY OF AGRICULTURE WHICH INCLUDES THE DEPARTMENTS OF RESEARCH AND SPECIALIST SERVICES, CONSERVATION AND EXTENSION SERVICES, VETERINARY SERVICES, AND TSETSE AND TRYPANOSOMIASIS CONTROL AND RECLAMATION, FOR THE YEAR ENDED 30TH SEPTEMBER, 1957.

J. R. CORRY, SECRETARY FOR AGRICULTURE.

Whilst the Federation has continued to enjoy prosperous conditions and the rising demand for agricultural produce has continued unabated on the internal market, the period under review has shown some changes in the general economic climate of the world. The latter half of 1956 saw the disturbing economic effects of the closure of the Suez Canal — rises in the basic prices of oils, higher transport costs affecting not only costs of imports but also prices realized for exports. 1957 has seen a spectacular fall in the price of copper, which in the previous year accounted for more than half of the total domestic exports of the Federation. But these factors apart, the period has once again been a time of prosperity for most primary producing and manufacturing countries. The farming industry despite a somewhat difficult season recorded satisfactory harvests for most of the main agricultural commodities, production of which in some cases reached record figures.

The season opened with useful and fairly general planting rains in early November, these being followed, however, by fairly continuous rain and protracted spells of overcast and cool weather which in turn was succeeded by a dry spell during January and February which was broken in most areas by good showers from the middle of February onwards until early March. With few exceptions grazing and water supplies were satisfactory. Details of crop yields are given elsewhere in this report.

During the year further progress has been made towards the alignment of the agricultural production and marketing systems of the constituent territories of the Federation. Federal Grain Marketing legislation has been passed covering Southern and Northern Rhodesia, whilst a special committee is examining the whole set-up of the dairy industry on a Federal basis. The Cold Storage Commission has agreed to extend its activities to Nyasaland at the request of the Government of that Territory.

AGRO-ECONOMIC SURVEY AND OTHER COST INQUIRIES

A final draft of the Agro-Economic Survey Report has been prepared for publication. The Economics and Markets Branch of the Ministry has been actively engaged on routine investigational work into farm costing and farm management problems.

The Branch is at present conducting a detailed inquiry relating to the cost of producing maize on farms spread over the areas of Southern and Northern Rhodesia and the first year's results of this survey have just been made available. The inquiry has been made on a new basis involving the collection of full farm accounting information together with a great deal of supplementary information relating to production, overheads and general farm activities. The material collected should be of considerable value both in connection with farm management advisory schemes and departmental planning and price fixing. The Branch is also recommencing dairy costings on 100 dairy farms spread over Northern and Southern Rhodesia and 100 tobacco farms are being investigated on behalf of the Tobacco Marketing Board.

The Federal Standing Committee on Agricultural Production assisted by Sir Frank Engledow, completed its task by the end of the year of framing an agricultural policy for the Federation and the Committee's report has since been published.

CROP PRODUCTION

Maize. The season opened with deliveries of maize to the Southern Rhodesia Grain Marketing Board from the 1955-56 crop reaching a figure of approximately 1,000,000 bags in excess of the forecast, whilst preliminary estimates for the 1956-57 plantings and harvest pointed to further record deliveries in both Rhodesias. It became apparent that the Federation had run into a fairly heavy surplus position and for the first time since the early days of the last war, arrangements were made for maize to be exported. By the end of June 883,918 bags of maize had been exported at an average realization of 27/6d. per bag and 55,968 bags of maize meal at 21/8d. per bag, both f.o.r. Salisbury.

It seems clear, however, that with forecasts of European deliveries in the vicinity of four million bags and African deliveries at a further one and a half million bags in the two Rhodesias, further substantial exports would be necessary after that date if reserve stocks at the end of June, 1958, were to be restricted to a carry-over equivalent to six months in each of the two Rhodesias, viz.: 1,200,000 bags in Southern Rhodesia and 675,000 bags in Northern Rhodesia and after careful examination of the whole position, arrangements were made for a total export programme between January, 1957 and June, 1958, of approximately 3,400,000 bags of maize and maize meal. The fact that it subsequently proved possible to implement this programme reflected great credit on all concerned and the part played by the Railway authorities in this programme must not be overlooked since their willingness to help in all directions proved of immeasurable assistance to the Grain Marketing Board and the Northern Rhodesia Maize Control Board in the smooth flow of maize to the ports.

In view of the rapid increase in maize production and the probability of the Federation being a net exporter of maize over the next few years it became necessary to review the basis of the maize price arrangement which existed between the Federal Government and the Rhodesia National Farmers' Union and agreement was finally reached on a basis which whilst it entailed an immediate sacrifice on the part of the producer offered him in return some assurance of long term stability. In addition to providing for the producer to relinquish 1/6d. per bag of his local price guarantee and for production cost increases to be disregarded until they reach an aggregate of five per cent. the new agreement provides that after the 1957-58 crop the producer will receive guarantees relating to local consumption and stock reserve requirements only and will undertake the whole disposal of surplus risk.

Sales of hybrid maize seed continued to increase and it is estimated that over 80 per cent. of the crop grown in Southern Rhodesia during the past season has been produced from double hybrid seed.

Small Grains—Kaffir-corn and Munga and Rupoko. Over the last few years the prices of kaffir-corn and munga have been controlled roughly in relation to the maize price so far as the producer has been concerned, but have been subject to fluctuating rates of subsidy for consumer purposes. The reluctance of the merchant to consume these grains with maize in free supply has given rise to a certain amount of marketing difficulty in face of which it was considered advisable to reduce the producer prices. Attention has also been given to the desirability of abandoning marketing control of these small grains but, for various reasons this does not appear to be practicable just at present.

At the end of September the Grain Marketing Board's stocks of kaffir-corn stood at 9,705 bags with a monthly consumption requirement of approximately 3,800 bags and it consequently became necessary to allow importation of this crop for brewing purposes. Stocks of munga on the other hand stood at 87,337 bags or over 12 months' supply.

In the case of rupoko, deliveries to the Grain Marketing Board during the 1956-57 marketing season were substantial and with consumption remaining more or less steady the combined effect of the last two seasons' deliveries plus importations in 1955 has been to leave the Board with a stockpile of 270,385 bags at 30th September which represents over three years' normal consumption requirements.

Ground-nuts

Marketing arrangements for ground-nuts have been under examination during the year but it would seem after exhaustive inquiry by the Agricultural Marketing Council, that existing marketing control provides the most efficient and cheapest method of handling this crop. The machinery of marketing from the African to the ultimate consumer is well understood, central marketing facilities make possible the implementation of grading provisions, without which the quality of the crop could never be expected to improve, internal distribution is facilitated, and the machinery ensures regularity, and continuity of supply. It is also a great help where export programmes have to be contemplated, especially in the face of all the present difficulties of ensuring quality and arranging railage, shipping and other facilities. Local consumers have come to rely on the Board's depot facilities of taking ground-nuts as and when they are required for consumption and have little or no provision themselves for long term storage. Whilst it would no doubt be possible to provide such storage, there is little question that this would prove far more expensive to erect than that which is already available.

During the year the price paid to the producer for ground-nuts in Southern Rhodesia and North Western Rhodesia was fixed at 83/- per bag. Deliveries to the Board up to the end of September amounted to 188,353 bags and this plus carry-over from the previous season left the Board with a stock of 133,000 bags on hand at that date representing approximately eight months' supply.

Potatoes

(a) *Southern Rhodesia.* By September, 1956, supplies of the first irrigated crop were finished and the Colony was depending on imports. The second irrigated crop was lifted from October onwards. At first it was thought the crop might be excessive, for extensive plantings Towards the middle of January, however, it became necessary to meet Matabeleland's requirements from imports. The pattern which has been establishing itself over the past few years was evident again when the main crop was lifted. Continued dull overcast weather in December brought on blight which depressed yields in varying degree on the Pentland Ace, Kennebec and Up-to-Date varieties. In consequence, supplies were sufficient to meet only about six weeks' needs from the time of lifting, this despite the larger crop which had been expected from acreages planted and which might have carried the Colony through to the lifting of the first irrigated crop. Imports were necessary from March onwards. The first irrigated crop was similarly affected. Traditionally, this crop is large enough to meet all consumer needs until the second irrigated crop is lifted in September, but attacks of blight on plantings reduced yields and supplies to a level sufficient only for two months' requirements. Imports were necessary from August onwards at a time when Southern African producers were having difficulty in lifting due to adverse weather conditions. Supplies were short in the Union and for a short time during this import period the price rose to high levels. Plantings of the second irrigated crop were greater than normal, par-

ticularly in Matabeleland. This crop had not been lifted in any quantity by 30th September, 1957, but all indications were that supplies would carry the Colony through until the main 1957-58 crop was lifted. Throughout the year under review producers were able to dispose of their potatoes through their selling pool at the maximum price.

(b) *Northern Rhodesia.* Broadly similar production patterns to Southern Rhodesia were manifest in Northern Rhodesia during the year under review. The 1956 second irrigated crop proved ample to meet all needs until a fortnight or so before the main crop was lifted in February. Small imports were necessary until the main crop was ready, but due to serious attacks of blight this latter crop was insufficient to meet consumers' requirements for the whole of the ensuing period. Imports were necessary from April onwards. As supplies of the first irrigated crop became available from June, imports were cut and no imports were necessary from July onwards. The first irrigated crop was of good quality and of sufficient size to meet requirements until shortly before the second irrigated crop, which promised to be large enough to meet all needs from the time it was lifted in October, 1957, until the main 1957-58 crop was harvested. The first irrigated crop, although of good quality, generally displayed poor keeping qualities which contributed to the necessity of import towards the end of the year under review. Producers experienced no difficulty throughout the year in selling all their potatoes at the maximum price.

Rice. Government continued to afford a large measure of protection to Nyasaland rice producers and agreed to the continuation of a price of £60 per ton f.o.r. Kota Kota. Unfortunately, poor production conditions and a certain amount of undesirable political activity resulted in the production of a short crop and heavy importations amounting to approximately one-third of total requirements had to be authorized during the last six months of 1957. Indications are that the 1957 crop will also be short of requirements but arrangements have been made to import substantial quantities of paddy from Tanganyika to assist with this shortfall.

Tobacco. Despite a difficult growing season and a substantial drop in total production, the 1957 tobacco crop proved to be one of the best quality crops for many years. As compared with the 1956 crop there was an appreciable increase in the percentage of middle grades whilst the percentage of nondescript grades dropped from 15.9 per cent. to 10.1 per cent.; a little more than 58 per cent. of the crop consisted of top and middle grades of all types.

The season has been one characterized with a strong buying demand from the very outset of sales and the unsettled features which so disturbed the 1956 marketing season have been markedly absent. During the year there were 2,817 growers of tobacco in Southern Rhodesia and North Western Rhodesia, a decline of 152 growers on the previous year. In addition, there were 48 growers in the North Eastern Province of Northern Rhodesia as compared with 67 during the previous growing season. There was a further indication of a revival of interest in the production of Turkish tobacco, the number of registered growers rising from 572 to 1,690, of whom 1,073 were European producers and 617 were African producers growing the crop under the auspices of the Southern Rhodesia Department of Native Affairs. There were also numerous growers of this crop in Northern Rhodesia though these are not registered under Federal legislation and the number and extent of their production is not known. In both Northern Rhodesia and Nyasaland African producers are being encouraged to produce Turkish tobacco under the auspices of their respective Governments.

The yield of tobacco harvested during the season fell from the previous high level of 173,000,000 lb. to approximately 144,000,000 lb.

The fire-cured Virginia crop produced in the Southern Rhodesian area underwent a further decline falling away from 342,482 lb. in the previous season to 94,730 lb. this year.

Sales of Southern Rhodesian and North Western Rhodesian flue-cured Virginia tobacco over the auction floors amounted to 144,285,536 lb. and resulted in a total realization of £23,671,511 0s. 10d. This amount, though £100,000 in excess of that realized last year, came from a crop some 27,000,000 lb. smaller than the previous year, average prices for tobacco rising from 32.96d. per lb. in the 1956 marketing season to an average of 39.37d. per lb. this year.

Sales of North Eastern flue-cured Virginia tobacco continued to decline. Whereas the 1956 season saw 1,979,258 lb. passing over the auction floors, the 1957 season saw only 1,282,921 lb. As a result, however, of the improved quality of the crop the general level of prices showed some recovery and rose from an average of 23.76d. per lb. in the previous year to the level of 33.7d. per lb., at a total realization value of £164,272 19s. 11d. Suggestions that the tobacco from the North Eastern Province should be sold unidentified with North Western and Southern Rhodesian tobacco have continued to be rejected by both buyers and other growers whilst alternatives providing for unidentified sale of this tobacco with post-sale identification have also been turned down as impractical.

Apart from the price features already mentioned, the most important features of the 1957 season were the heavy demand for middle grade tobaccos, the low purchases of the South African buyers as compared with their very large purchases in the previous season and the emergence of the Netherlands as the Federation's second largest customer, with a purchase well in excess of that made by the important Australian market. The United Kingdom and the Australians have continued to be heavy buyers and have taken their full share of purchases. Despite the firm nature of the prices for the middle and lower grades, the market has been very well supported by Continental and general overseas buyers.

The comparative figures in respect of destination of purchases are set out below:—

Destination	1955–56	1956–57
United Kingdom	51·07	56·46
Australia	5·42	6·46
Local market	4·53	5·73
Other markets	38·94	31·36
Unallocated	0·04	·03
	100·00	100·00

Purchases of the North Eastern Rhodesian crop have differed from the above pattern. Very much less interest has been displayed by the United Kingdom in the North Eastern Rhodesian product and purchases by Australia have been virtually non-existent. On the other hand, Continental interest has remained strong.

Although the marketing of Nyasaland tobacco does not come under the control of the Federal Government it may be noted that during the 1957 selling season, Nyasaland's offerings of flue-cured tobacco have declined from 4,089,594 lb. to 2,989,301 lb. and that with an average price realization of 27.25d. per lb. the value has only declined to £339,373 from last year's level. Sales of dark fire-cured tobacco have remained approximately stable at 25,415,004 lb. as compared with 25,299,326 lb. last year. This dark fire-cured tobacco realized, however, an increased value of £2,024,714 as compared with last year, an average realization of 19.12d. per lb. Sun-cured leaf produced in Nyasaland totalled 3,023,874 lb. with a total realization of £312,593 or an average price per lb. of 24.81d. The total amount of Burley marketed declined somewhat to 2,168,556 lb. at a realization value of £316,700, or an average price of 35.05d. per lb.

Turkish Tobacco. As reported earlier, the production of Turkish tobacco showed a tendency to increase.

The Turkish Tobacco Co-operative Co. of Rhodesia has continued to interest itself principally in the Soulouk type of tobacco or the Ismir type, which is the principal type of Turkish produced in the Middle East. The quantity of this type of tobacco expected to offer in the Southern Rhodesian area this year is of the order of 560,000 lb. The Falls City Tobacco Co. Ltd. of America has stimulated considerable interest in the Samsoum type of tobacco which is the Baffra type and which is the minor type produced in the Middle East but which is the most highly priced and lucrative type. The Southern Rhodesian production of this type in the current season is likely to be of the order of 50,000 lb. There is also some interest in Northern Rhodesia and Nyasaland. The Northern Rhodesian crop is being produced by both Africans and Europeans and is not expected to exceed 85,000 lb. this year, most of which will be the Samsoum type.

Pigs. Production of pigs in the Federal area has shown a general recovery although it has not yet reached the position it achieved in 1954. Although production has increased in both Northern and Southern Rhodesia, the very active sales policy of the Cold Storage Commission's Pig Division and the initiative of its management in putting new lines of pig products on the market has resulted in an even more rapidly expanding consumer demand. In consequence, the Federation has imported heavily during the year under report a total of about 14,000 pigs. Nevertheless, the pig production position needs to be most carefully watched. There is every indication of a continued increase in the sow population and it must never be forgotten that an increase of only about 1,500 pigs per month would satisfy all local market demands and result in an export surplus.

During the year the Cold Storage Commission has finally divorced itself of responsibility for pig marketing in Southern Rhodesia, and has handed over complete responsibility in this Territory to the Rhodesia National Pig Breeders' Co-op. Co. Ltd., which has formed a subsidiary central co-operative to take charge of its actual bacon factory operations.

Milk. The dairy industry has experienced another year of continued expansion. Over the 12 months ending 30th September, milk delivery to the Dairy Marketing Board again showed an increase from 8,834,696 gallons to 9,737,014 gallons equivalent to 10.2 per cent. Whole milk sales also showed an increase but not to the same extent as production, whole milk sales rising to 6,568,764 gallons. In addition to whole milk sales 110,145 gallons were separated for fresh cream sales; 34,942 gallons used in ice-cream manufacture and since June, 20,154 gallons of whole milk sent to Portuguese East Africa. During the year 2,210,558 gallons have been converted into cheese, 548,342 gallons separated for butterfat and since February 186,010 gallons used in the manufacture of dried skim milk.

Differential milk prices were in force during the whole period. From October, 1956, until March, 1957, a price of 2/10d. per gallon was payable from December until February, a price of 3/8d. per gallon from March to June and a price of 4/- per gallon from July to November for all milk consumed as whole milk plus an allowance of 20 per cent. with surplus over and above this being paid for at 1/9d. per gallon. On the 1st April producer prices were adjusted together with an alteration in the differential price structure. A price of 3/- per gallon payable from December to February, a price of 3/10d. per gallon from March to June and a price of 4/2d. per gallon from July to November for all milk consumed as whole milk plus an allowance of 83,333 gallons per month equivalent to one million gallons per year. Milk in excess of this quantity will be purchased by the Dairy Marketing Board at its net realization value which is expected to be approximately 1/8d. to 1/9d. per gallon.

The effect of this price policy by Government, whereby unlimited quantities of milk were paid for at guaranteed prices was abandoned and the systems mentioned above introduced, has been to lower the price paid to producers to the extent shown below: —

	Guaranteed Price	*Actual Payout to Producers.*
1956		
October	48.0d.	44.9d.
November	48.0d.	42.4d.
December	34.0d.	29.7d.
1957		
January	34.0d.	30.1d.
February	34.0d.	31.8d.
March	44.0d.	41.2d.
April	46.0d.	41.8d.
May	46.0d.	42.6d.
June	46.0d.	43.1d.
July	50.0d.	45.6d.
August	50.0d.	44.3d.
September	50.0d.	44.0d.

The lower payout as compared with the guaranteed price has resulted from the large quantity of milk received above whole milk requirements and consequently paid for at a price of 1/9d. per gallon.

Supplies of milk have been more than adequate to meet all requirements of Cheddar and Gouda Cheese and the Dairy Marketing Board in endeavouring to obtain the largest realization value for surplus milk has opened up other outlets for its disposal. These activities include milk separation for butterfat and the sale of the resultant skim milk to the African population, further quantities of this skim milk are now being dried for sale as skim milk powder. Sales of fresh cream and ice-cream have been increased and within recent months the sale of whole milk to Portuguese East Africa has been undertaken. Experiments with the production of Roquefort Cheese are proceeding and plans are afoot for the production of other types of luxury cheese.

All dairies in the main consuming centres are now under the control of the Dairy Marketing Board and plans are proceeding for the ultimate construction of a new dairy in Salisbury. During the year inquiries have been made by private concerns regarding the setting up of plant for the manufacture of milk by-products.

The Federal Government has remained responsible for the milk prices in Northern Rhodesia. Alterations in price arrangements have been made during the year. Prior to April, producer prices were 2/2d. per gallon payable from December to February, 3/3d. per gallon payable from March to June and November and 3/10d. per gallon payable from July to October with no differential producer prices scheme in operation. From April new producer prices were gazetted which were 2/4d. per gallon payable from December to February, 3/5d. per gallon payable from March to June and November and 4/- per gallon payable from July to October and at the same time a differential producer prices scheme was introduced on the same basis as that operating in Southern Rhodesia except that the margin allowed above whole milk sales is 27,000 gallons per month. Differential prices have as yet had little effect on producers' prices due to the relatively small surplus. Production of whole milk is increasing but sales, especially since the opening of the new Kitwe Dairy, have also shown a healthy increase.

During the 12 months under review a total of 1,880,558 gallons of milk was handled by the Co-operative Creameries of Northern Rhodesia of which 1,344,688 gallons was sold as whole milk and the balance converted into cheese.

Cattle. The year was a successful one for cattle production.

A substantial increase took place in the total cattle population of the Federal states. There was a decrease, however, in the number of cattle slaughtered during 1956. Producers held cattle back in anticipation of a price increase as a result of the Turner Commission recommendations. During 1957 supplies were well maintained and were well distributed throughout the year. There was a decrease in the number of higher grades coming on to the market in the controlled areas and an increase in G.A.Q. and the lower grades.

The numbers of immature stock and potential breeding stock slaughtered were lower than during the previous year.

Costs of beef production increased by 3.2 per cent. This increase was distributed over the grade prices in an effort to add to the off-season stimulus.

With regard to general production trends, there has been no increase in the fertility of breeding herds during the last ten years. Similarly mortality rates remain relatively unchanged. Any increase in the present slaughter rate, unaccompanied by an increase in the rate of natural increase would result in a decrease in population numbers.

The free market for cattle which resulted from the implementation of the Turner Commission's Report in 1956 has now been in operation for a full year. Whereas most Europeans have continued to support the Cold Storage Commission to the full, all native cattle, other than those emanating from the veterinary quarantine sales, have been sold over auction sales. Of the total production 17,110 slaughter stock were sold of which 301 were purchased by the Cold Storage Commission and the balance was sold to other buyers. In addition, 19,497 selected stock have

been sold by auction. Whilst G.A.Q. stock have been sold at prices closely approximating to Government guaranteed prices, the prices for F.A.Q. have averaged 5/4d. per hundred in excess of those guaranteed by Government and the prices for Compound stock have averaged 8/11d. in excess of Government guaranteed prices.

Further progress has been made towards integration of cattle and beef marketing on a Federal basis. During the year all restrictions have been lifted on the movement of breeding or immature stock as between the two Territories of Northern and Southern Rhodesia and Northern Rhodesian butchers have been allowed to purchase the equivalent of 26,000 head of cattle in the Southern Rhodesian area. Most of this has been taken up in the form of carcases from the Cold Storage Commission. In the face of abundant supplies importations from the Bechuanaland Protectorate have been restricted to 14,000 head as compared with the level of 40,000 head in the previous year. The Federal Cattle and Beef Advisory Committee has continued to function and steps have been taken towards the establishment of the Cold Storage Commission as an operative agency in Nyasaland.

Poultry and Eggs. Throughout the period under review the supply position in Southern Rhodesia has been satisfactory. For only a short period towards the middle of 1957 were supplies of good quality table birds inadequate to meet the demand, while for the rest of the year supplies were available in sufficient quantity to meet also a part of Northern Rhodesia's requirements.

The picture in Northern Rhodesia was also good, with production increasing throughout the period. Nevertheless, the Territory's own production is still insufficient to meet the demand and continual importations from both Southern Rhodesia and the Union were necessary to satisfy consumers' needs.

Production of day-old chicks in both territories increased during the year. All the signs are that in 1958 Federal production of day-old chicks will be largely adequate to meet the demands of the market. Nevertheless, it will still be necessary to import special types of chicks not available in the Federal area, while table poultry sufficient to meet Northern Rhodesia's demands will also have to be imported to make good the deficit in Federal production.

All the indications are that the market can take another 7,000 - 10,000 birds per month from local production and with the protection which can be afforded through permit control it is up to the producer to take advantage of this situation.

Production of eggs during the year has been generally adequate to meet the market demand. Neither imports nor exports have taken place, although at no time did prices fluctuate to the extremes which indicate shortage or glut. Of assistance in this field were the operations of private enterprise firms who stored eggs from the flush season to the short period. At the same time the integration of the economies of the two Rhodesias was carried a step further with the opening up on a fairly large scale of the Northern market to Southern egg producers. The product was well received there and augurs well for future developments.

REPORT OF THE DEPARTMENT OF RESEARCH AND SPECIALIST SERVICES FOR THE YEAR ENDED 30th SEPTEMBER, 1957

R. R. STAPLES

DIRECTOR OF RESEARCH AND SPECIALIST SERVICES

The presentation of the Annual Report of the Department follows the procedure adopted last year. The introductory section deals with matters affecting the Department as a whole, and items of particular interest: The remaining 14 sections cover in more detail the wide range of work of the Specialist Branches and Research Stations, as presented by their respective Heads, as follows:—

1. CROP PRODUCTION by T. K. Sansom, Chief Agriculturist.
2. ANIMAL PRODUCTION by J. C. Raath, Chief Animal Husbandry Officer.
3. THE DAIRY INDUSTRY by R. G. Jones, Chief Dairy Officer.
4. POULTRY by G. H. Cooper, Chief Poultry Officer.
5. PASTURE RESEARCH by Dr. O. West, Chief Pasture Research Officer.
6. GWEBI AGRICULTURAL COLLEGE by Dr. W. L. Fielding, Principal.
7. HENDERSON RESEARCH STATION by Dr. J. W. Rowland, Officer-in-Charge.
8. GRASSLANDS RESEARCH STATION by H. D. L. Corby, Officer-in-Charge.
9. MATOPOS RESEARCH STATION by J. M. Rattray, Officer-in-Charge.
10. SABI VALLEY EXPERIMENT STATION by P. D. Waister, Acting Officer-in-Charge.
11. GATOOMA RESEARCH STATION by A. H. McKinstry, Officer-in-Charge.
12. CHEMISTRY BRANCH by Dr. B. S. Ellis, Chief Agricultural Chemist.
13. ENTOMOLOGY BRANCH by J. A. Whellan, Chief Entomologist.
14. BRANCH OF BOTANY, PLANT PATHOLOGY AND SEED TESTING by Dr. G. R. Bates, Chief Botanist and Plant Pathologist.

Horticulture is at present a sub-Branch under the direction of the Chief Agriculturist and details of the progress in the horticultural field, therefore, are included in his Report. The Salisbury Experiment Station as well as the Panmure Hybrid Maize Station and the Melsetter Pasture Station fall directly under the Chief Agriculturist and Chief Pasture Research Officer respectively; reports on the work of these stations are given in the appropriate sections of the Report. Accounts of the progress in the work of the Nyamandhlovu Pasture Sub-Station and the Tuli Pasture Sub-Station are given in the Report of the Officer-in-Charge of the Matopos Research Station.

Staff. Following the inspection of the Department, together with the other Departments in the Ministry, by inspectors of the Federal Public Service Commission in 1956, the creation of an Assistant Director's post in the Department was recommended. This additional post is urgently required to relieve the Director from an overwhelming amount of administrative detail and to allow more time for matters of policy and the co-ordination and direction of research. Unfortunately the financial situation has necessitated the post being left in abeyance for the time being.

New posts created in the Department during the year included five for professional officers, seven for technical officers and three for clerical officers. The work of the Department was again seriously affected by a large number of resignations, particularly in the Chemistry Branch and amongst the technical staff. Difficulty was also experienced in filling certain specialist posts, more especially in the horticultural, dairying and pedological fields. The general picture of the present staff position in the Department is given below:—

Establishment.	
Superscale posts	8
Senior professional officers	24
Professional officers	58
Technical officers	94
Clerical officers	23
Graded African posts	66
Total number of posts	273
Resignations. 1956/57	
Professional officers	6
Technical officers	26
Transfers. 1956/57	
Professional officers	3
Technical officers	4
Officers appointed. 1956/57	47
Vacant posts. 30/8/57	12

Departmental Conference. The third annual Conference of the Department was held in the Duthie Hall on the 1st and 2nd of April. The theme was "Beef Production in the Federation" and the Conference was opened by Dr. A. E. Romyn, O.B.E., a former Secretary for Agriculture. In his opening address Dr. Romyn outlined very clearly some of the major problems of beef production under Rhodesian conditions. Sixteen papers, covering the entire field of beef produc-

tion in the Federation, were presented. A feature of the papers and the discussions was the emphasis placed on the ecological aspects of production.

In addition to the professional officers of the Department, a large number of representatives from other Departments in the Ministry attended the Conference, as well as representatives from the Department of Native Agriculture, the Departments of Agriculture, Northern Rhodesia and Nyasaland, the Rhodesian National Farmers' Union and the Natural Resources Board. The papers presented are being published as a symposium on Beef Production in the Federation.

Progress in Research. As in previous years, a wide range of research problems were under investigation. Excellent progress in many of these projects was maintained, particularly in the field of soil fertility, pasture leys, economic methods of beef production, and the production of improved strains of hybrid maize seed. Visiting authorities have invariably been much impressed with the achievements of the Department, with its comparatively modest resources, in the research field.

Horticultural research, however, is still quite inadequate for the needs of this important industry, which we feel has a very great potential, both in meeting the Federation's rapidly growing requirements of fruit and vegetables and for export, for example, of citrus fruits and vegetable seeds. As the first step towards improving these services, two senior horticulturists, from the Union Department of Agriculture, were invited to visit Southern Rhodesia and advise on the scope for expansion of fruit and vegetable production and the steps which should be taken to achieve this. Their main recommendation was that the research services for horticulture should be greatly strengthened. Unfortunately it has not been possible to implement this recommendation, owing to the present financial stringency.

In any future expansion of the Department, high priority should be given to the strengthening of the horticultural branch, which for too long has been the cinderella of the Department. Certain very specialized fields of research — for example, microbiology, soil physics and biochemistry — also urgently require additional staff.

Cotton Insect Pests. The joint research scheme, mentioned in my last report, on the control of cotton insect pests, particularly Red Bollworm and Stainer, has operated smoothly during the year, although the recruitment of the third entomologist for the team has so far not been successful. The cost of this scheme is being jointly financed by the Federal and Nyasaland Governments and the Colonial Development and Welfare Fund. Promising results have been obtained with the use of certain insecticides, and biologic methods of control will also be explored, as these may well prove more satisfactory, especially with African growers. The cost of the scheme for the first three years is approximately £43,000.

Central Laboratory Development. The new soil testing laboratory was completed, and the facilities for this important service are now excellent. Provision was also made on the loan votes for a new entomological and plant pathology block, as the present laboratories are most unsatisfactory and now quite inadequate to meet the requirements.

The Ministry is fortunate in having the Salisbury Experiment Station as the headquarters centre for its scientific services. This centre is exceptionally well situated for this purpose and very conveniently placed for the visiting public. An appreciable part of the land available for building purposes has been taken for other development by Government, but it is important that there should be no further encroachment on this land, if the long term needs of the Department are to be safeguarded. It is necessary also to draw attention to the need for careful planning in connection with the future development of the centre.

Production of Wheat. Special mention should be made of the possibilities for wheat production in the Federation. Consumption of bread within the Federation is increasing rapidly and farmers, stimulated by provocative articles appearing in the press, have taken a lively interest in the breeding of rust resistant strains of wheat for summer production, as an alternative crop to maize. It is necessary, however, to sound a note of warning. Experience in Kenya and elsewhere has shown that resistance to rust is very liable to break down, owing to the numerous existing physiologic strains of this group of fungi and new strains are continually being found or produced. Moreover, there are other diseases affecting summer wheat, and the high temperature and humidity conditions during our rainy season are generally unfavourable for the production of high per acre yields of wheat, as compared with maize. There is also the difficult problem of weed control in summer grown wheat.

Conditions in the Federation, however, are generally favourable for winter wheat production, where the water requirements of the crop can be provided by irrigation or the soil is naturally moist in the dry season. Wheat under irrigation has long been grown successfully but high cost of production is a limiting factor. There are, however, in the Rhodesias and in Nyasaland, considerable areas of naturally moist land which is too wet for summer crops, but offers possibilities for wheat production in the dry season. These soils have problems of drainage, water control and fertilizing which need investigations for their solution. A special departmental committee has therefore been set up to plan a programme of experiments, the results from which should provide a reliable guide for future policy on this important matter.

Legume Production. A major weakness in the agriculture of the Federation is the lack of suitable pasture legumes. This means that the nitrogen required for the growth of nutritious

pasture and for maximum improvement in soil fertility from the use of grass leys, in all except very limited areas of winter rainfall or irrigated land, must be applied as fertilizer, which is expensive. Application was therefore made to the Food and Agriculture Organization of the United Nations for a fellowship to enable Mr. H. D. L. Corby to proceed on a study tour to Australia, where notable progress has been made in growing pasture legumes successfully under a wide variety of conditions in which previously they could not be grown. Mr. Corby has now returned from his six months study tour, and it is hoped that substantial progress in this important field of research will be made in the next few years.

Potato Production. The fungus disease of potatoes, Late Blight, unfortunately introduced a few years back in importations of seed potatoes from Europe, has jeopardized the potato growing industry in both the Rhodesias. From the satisfactory position of the Federation being about self-sufficient in potato production, in 1956 and 1957 about one-third of our requirements had to be imported, frequently at a cost considerably higher than the local maximum prices. It is very gratifying to be able to report that with the appointment of a potato Plant Breeder to the staff of the Salisbury Experiment Station, the position has greatly improved as varieties with a considerable degree of resistance to Blight are now available to growers. The Farmers' Co-op., Salisbury, has contributed £1,000 a year for a period of three years towards the cost of this important work. It is a pleasure to pay tribute to this very generous assistance.

Agricultural Research Council. With Federation and the rapid expansion in the whole field of agriculture, it has become increasingly apparent that more effective arrangements are required for the co-ordination of research. In the Federation at present, separate research services are being developed (or efforts towards this end are being made) by seven Government departments as well as by several independent organizations, notably the Federal Tobacco Research Board of Rhodesia and Nyasaland, a situation which tends to result in much duplication of effort and wasteful expenditure. The ideal would be to have one research service (and indeed a unified agricultural service for the Federation as a whole), but as this is not possible at this stage recommendations were put forward for the establishment of an influential Agricultural Research Council with wide representation, including organized agriculture. The Rhodesian National Farmers' Union and the Natural Resources Board of Southern Rhodesia have been pressing for such a Council. The matter has also received consideration by the Federal Standing Committee on Agricultural Production in collaboration with Sir Frank Engledow — a noted authority on the organization of agricultural research — and it is hoped that Government will accept the recommendation that the Council should be set up in the near future.

Federal Agricultural Policy. The Director served as Chairman of the Federal Standing Committee on Agricultural Production, which spent much time, assisted by Sir Frank Engledow, on an examination of the agriculture of the Federation, including the research and advisory services provided by Governments. These investigations confirmed the views that there is an urgent need for the closer co-ordination of the agricultural services, particularly in regard to production plans and in the field of research. The Committee's report to the Federal Minister of Agriculture, on Agricultural Policy in the Federation has now been published.

Committees and Boards. The Director served on the following Committees and Boards:—

(i) Federal Standing Committee on Agricultural Production (Chairman).
(ii) Federal Research Advisory Committee (Chairman).
(iii) Ministry's Research Advisory Committee (Chairman).
(iv) Tobacco Research Board.
(v) Land Settlement Board.
(vi) Cabinet Sabi Valley Development Co-ordinating Committee.
(vii) Tsetse and Trypanosomiasis Committee.

In addition, senior officers of the Department served on numerous inter-departmental committees.

Visits Outside the Federation. International Conferences and Meetings attended by officers of the Department during the year were as follows:—

(i) International Grassland Conference in New Zealand.
(ii) Inter-African Phytosanitary Commission meeting in London.
(iii) Southern African Regional Phytosanitary meeting in Pretoria.
(iv) Council Meeting of the International Red Locust Control Service, in Dar-es-Salaam, Tanganyika Territory.
(v) S.A.R.C.C.U.S. meeting in Windhoek, South-West Africa.
(vi) Second Symposium on Inland Fisheries in Brazzaville, French Equatorial Africa.

In addition:—

(i) Dr. O. West, Chief Pasture Research Officer, was seconded to the Food and Agriculture Organization of the United Nations to undertake a survey of the pasture potential of the Federation of Malaya.
(ii) J. M. Rattray, Officer-in-Charge, Matopos Research Station, was seconded to the Food and Agriculture Organization of the United Nations to prepare a Grassland Map of Africa.

(iii) H. D. L. Corby, Officer-in-Charge, Grasslands Research Station, was granted an F.A.O. Fellowship to make a special study in Australia, New Zealand and Britain, of current methods of dealing with the problems of growing legumes.

(iv) Dr. H. Wild, Senior Botanist, spent the year on secondment to Kew and the British Museum in connection with the joint scheme on the production of the Flora Zambesiaca.

(v) W. S. Soane, Soil Physicist, Sabi Valley Experiment Station, spent the year on a study tour in the United States, under the I.C.A. assistance scheme.

(vi) F. E. M. Gillham, Plant Breeder, Gatooma Research Station, visited the Cotton Research Station, Namulonge, Uganda.

(vii) A. P. Mackay, Pasture Research Officer, Matopos Research Station, visited Australia on a Nuffield Bursary to study pasture improvement methods.

(viii) The Director visited Cedara Agricultural College, Natal, in connection with an examination of the Diploma Course at Gwebi Agricultural College.

Acknowledgments. Close co-operation was maintained with the Department of Conservation and Extension in serving the farming community with specialist advice; also with the many departments and organizations connected with agriculture. Finally, I wish to express my appreciation to all officers in the Department for their loyal support, enthusiasm and hard work during the year under review. It is no exaggeration to say that the esprit-de-corps in the Department was excellent.

1. CROP PRODUCTION

T. K. SANSOM

CHIEF AGRICULTURIST

Seasonal Conditions. The 1956-57 season was a wet one in most areas of the Federation, and disastrously so in some places. The outstanding features were the well marked beginning to the main rains on October 27th-28th, a wet November and December rather less so.

A break in the rains in January was followed by heavy rain which caused flooding in the northern territories in February and in Southern Rhodesia in March. The season ended early, as it had begun, on the 13th March in the southern half of the Federation, though rains continued longer in the north. Considerable shower and thunderstorm activity was a feature of the post-rainy season in April.

THE MAIZE CROP

Estimate of Yields. The maize crop continues to show a steady expansion each year as the following table shows:—

Season	No. of Growers	Acreage Planted	Crop Reaped (bags)	Yield per acre
1950–51	3,916	343,521	1,176,528	3·42
1951–52	4,095	361,024	2,454,047	6·80
1952–53	4,176	363,204	2,360,011	6·50
1953–54	4,154	359,709	2,687,314	7·50
1954–55	4,170	364,059	2,734,920	7·51
1955–56	4,087	342,509	3,434,797	9·74
1956–57 (estimated) .	4,100	360,000	4,000,000	11·11

This continued expansion in production has again been due to a succession of good rainy seasons, the increased use of hybrid seed and to improved farming methods.

Reference to the above table shows that the 1955-56 crop was nearly three times the size of the 1950-51 crop which, however, was produced in a season of poor rainfall. It is interesting to note that the average yield per acre in 1955-56 for the whole Colony, which includes districts which are not really suited to the growing of maize, exceeds the average yield of the four principle maize growing districts of Salisbury, Hartley, Lomagundi and Mazoe of only a few years ago.

The estimates for the 1956-57 season show a still further increase in the crop. It is estimated that 4,000,000 bags will be produced from 360,000 acres which gives an average yield of 11.11 bags per acre for the whole country. This average yield is considerably above the previous season's average and very considerably above average yields of only two or three years previously which were at that time the highest on record. Reference to per acre yields of the principal maize growing districts shows that these yields now approach very closely indeed to those of the principal corn growing States of North America. For instance the average yield for the Mazoe district is expected to amount to 14.5 bags per acre which is almost the same as that of the average yield of Iowa, probably the foremost corn growing state of the United States.

Not only will the 1956-57 crop supply all the country's requirements but there will be a considerable surplus for export as well.

Export of Maize. Maize was exported overseas for the first time since the very early days of the last war. The Chief Agriculturist was responsible for the grading and passing of maize for export at the beginning of the export season in January but by March it was considered that officials of the Grain Marketing Board had by that time acquired sufficient experience to grade and pass consignments of maize themselves. At the beginning, the maize was of a very poor standard, but as the season went on the quality improved considerably. Samples have been regularly submitted to the Seed Analyst for test so that there is a record of all representative samples of maize exported.

Maize Moisture Testing. Only a very few samples of maize were submitted for moisture tests during the past season. There were no reports of farmers having sent maize to the Grain Marketing Board's depots which had a moisture content higher than 12.5 per cent.

Southern Rhodesia Seed Maize Association. The Southern Rhodesia Seed Maize Association and Government continue to employ two full-time inspectors. As in the past, the Association pays two-thirds of the Inspectors salaries while Government contributes one-third and pays for all travelling expenses.

Final Report for the 1955-56 Season. The total area for the production of hybrid seed was 3,439 acres. This includes 209 acres for members who grow for their own use only, and 110 acres left unsown or disqualified. The seed marketed was grown on 3,100 acres. The amount sold was 24,812 bags of 200 lb. This is about 2,500 more than in the previous year. During the month of November there was a frantic rush for more seed by commercial growers who found they had to replant, or that they were short for other reasons. It was estimated that 1,000 bags more could have been sold. Several members had previously sent hundreds of bags of good seed to the Grain Marketing Board and all concerned were much surprised at the sudden demand for so much more seed. It was estimated that some 30,000 bags of seed were produced by members. It should be noted, however, that nearly one half of the members did not fulfil their quota plus the 20 per cent. they were asked to keep in reserve.

On the whole, the grading of the seed was better than it had been in previous years. Most of those members whose machines had previously not eliminated the large round kernels satisfactorily made the necessary alterations to remove them, and by paying more attention to the removal of the tips, produced seed more uniform in size and so satisfactory to the buyers that no complaints were received from purchasers.

There was, however, a larger proportion of chipped kernels which indicated that some members did not pay sufficient attention to the handling of the ears on the threshing floor. Fortunately now that the Nilson mechanical sheller, which rubs the seed off the cobs without chipping the kernels, is available, the production of seed free of damaged kernels can be looked forward to in the future. In general detasselling was done with greater care than in previous seasons. Most growers now realize that it is better to keep the work well in hand rather than risk having female pollen shedding at the critical period of silk emergence. A number of growers, however, still fail to employ effective methods of distinguishing the male rows.

Interim Report for the 1956-57 Season. The total area sown to produce seed for sale was 3,490 acres. This is nearly 300 acres more than last year. The area sown by those who produce solely for their own use was reduced to 88 acres, as a result of the adoption of the rule of issuing seed proportionate to the acreage devoted by the applicants to their commercial crops.

Two members, who produced last year, have no seed for sale this year. Three members have completed their probationary period and each has a sales quota of 50 bags. Six new members are serving a probationary period. One of these lives at Kalomo in Northern Rhodesia. Fifty-four members will have seed for sale, but at least eight of them will not be able to fulfil their quotas. The number who will not be able to supply the 20 per cent. reserve is not yet known.

Owing to the increased sales last season, it was decided to increase the estimate of sales from 20,000 to 23,000 bags this season and the quotas were advanced accordingly. This increase with the addition of 20 per cent. to be held in reserve brings the target to 27,600 bags this season. There has been an exceptionally keen demand for seed this season and considerably more has been sold than in previous seasons. Sales in Northern Rhodesia continue to increase owing to the suitability of Southern Rhodesian hybrid seed for the conditions there. A few members continue to market seed of open-pollinated varieties such as Hickory King, Southern Cross and Salisbury White.

A few tentative inquiries have been received from overseas for hybrid seed, but the price offered has not been considered sufficiently attractive to market the seed.

Membership of the Association. The following table gives a comparison between the 1956-57 season and previous seasons.

Season	Total Membership	Producing Hybrid seed	Total acreage grown	Seed available for sale in bags of 200 lb nett.
1948–49	57	40	350	1,774
1949–50	77	65	3,150	13,367
1950–51	91	69	3,275	17,226
1951–52	100	77	3,500	20,800
1952–53	96	80	3,113	20,500
1953–54	94	70	3,580	25,500
1954–55	90	68	2,765	25,000
1955–56	93	53	3,100	24,812
1956–57 (estimated) .	92	55	3,490	27,660

Hybrid Maize Farm. The first crop of single hybrid seed was produced on Panmure Hybrid Maize farm during the 1956-57 season. Approximately 130 bags of the female N3 x A and 70 bags of the male M9 x T were produced. The seed is of exceptionally high quality and considering that this farm had been very badly misused in the past and that several maize crops had been grown in succession, yields were very good indeed.

Work on the siphon under the Mazoe River which was expected to be completed at the end of October, 1956, to insure against a drought period had to be abandoned owing to its non-completion before the start of the rains. Fortunately the distribution and amount of rain was sufficiently good to ensure a good crop. A new caterpillar D2 tractor, heavy plough and disc harrow have been purchased during the current year, so that the ploughing and preparation of land will be very greatly improved during subsequent seasons.

Seed Maize Prices. There has been no change in the prices for seed maize during the present season which remain as follows:—

Certified Double Hybrid Seed — Large Flats and Medium Flats:	£5 10s. 0d. per bag of 200 lb nett.
Certified Double Hybrid Seed — Large Rounds:	£3 10s. 0d. per bag of 200 lb nett.
Certified Double Hybrid Seed — Small Rounds:	£3 5s. 0d. per bag of 200 lb nett.
Certified Open Pollinated Seed:	£4 0s. 0d. per bag of 200 lb. nett.

At present only Certified Double Hybrid Large and Medium Flat seed is sold by the Southern Rhodesia Seed Maize Association.

WHEAT PRODUCTION

Summer Wheat. The acreage grown and the quantity of summer wheat produced was negligible. Small plantings were done by farmers, but these are not likely to increase to any considerable extent until a really satisfactory summer wheat is produced. As in the past, trial plots embracing fertilizer and spraying trials for weed control continue to be grown on the various Government Research Stations.

Winter Wheat. The 1956 winter wheat crop amounted to 15,441 bags comprising 12,353 bags grown on 1,914 acres of irrigated land, giving an average yield of 6.4 bags an acre and 3,108 bags grown on 902 acres of vlei land giving an average yield of 3.4 bags an acre. The total crop amounted to 4,709 bags more than in the previous season but was still only a fraction of the Federation's requirements. Winter wheat trials were conducted on various Research Stations.

Wheat Breeding. Since the Wheat Breeder was appointed in September 1955 two summer and two winter crops have been grown. During this period many hundreds of varieties, selections, strains and crosses have been tried out. A large number of artificial pollinations have been made during the past season amounting to approximately 100 during the summer and 250 during the winter. The resulting F 1 seed is first screened in a rust nursery. Selection has been carried out in the F 2, F 3 and F 4 material. It is possible that final selections from the earliest crosses will be made in the summer of 1959. A number of highly resistant strains were obtained from the International Rust Nursery.

SORGHUM PRODUCTION

Sorghum growing continues to attract little attention from European farmers. It is unlikely that this crop will make any headway while a succession of good seasons continues. In the meantime work is in progress at Matopos Research Station on the introduction, selection and breeding of new varieties.

RHODESIA SEED POTATO ASSOCIATION

During the past year the Eastern Growers' Association and the Salisbury Area Potato Growers' Association combined to form the Rhodesia Seed Potato Association. This will facilitate very considerably the production and sale of improved seed as growers in the two areas are now in much closer association with each other.

Potato Breeding. A start has been made by the Potato Breeder in the selection of more blight-resistant strains. From the 64 seedlings grown in observation plots six were selected as promising and retained for further trial.

MISCELLANEOUS CROPS

Dwarf Castor Bean. There has been a very considerable revival of interest in the growing of this crop during the past year. At last an organization for the purchase of seed has been established in the country. It is confidently hoped that this crop will be a useful alternate cash crop especially in the drier areas. The Department has conducted a country-wide series of fertilizer and variety trials which will yield valuable information on the most suitable localities, varieties and fertilizer treatments.

For the present at any rate no breeding work is being done owing to lack of staff, but a considerable amount of experimental and selection work is in progress at the Matopos Research Station.

Kenaf (Hibiscus cannabinus). This crop has shown great promise in the past in experiments on research stations and in trial plantings by farmers. It produces a fibre equal in quality and in some respects superior to jute. The main obstacle in the growing of the crop has been the lack of suitable decorticating machinery as it has not been considered economic to rett the fibre in water. During the past year a machine has been produced in Umtali which, it is stated, decorticates the fibre sufficiently satisfactorily for the manufacture of bags. There has been a very great deal of interest shown by farmers in the growing of the crop and it is estimated that some 450 acres have been planted. This, along with Castor bean, is a crop which could occupy a useful place in the farming economy of the country especially in a rotation with maize.

GENERAL

Maize Breeders' Conference. The Fifth Annual Maize Breeders' Conference was held in Salisbury for the first time. Delegates from the Union of South Africa, Kenya, Nyasaland, South West Africa, Northern Rhodesia and Angola attended. The Conference lasted for five days, the first two of which were spent in the reading and discussion of papers. The remaining three days were spent in visits to maize farms where double hybrid seed was being produced and to research stations.

It was the unanimous opinion of all delegates that this was the most successful of all the Conferences held so far.

Agricultural Shows. The Chief Agriculturist and Staff judged the maize, agricultural produce and district exhibits sections at the Umtali, Salisbury, Bindura, Sinoia, Gatooma, Fort Victoria, Gwelo, Bulawayo, Livingstone and Lusaka Shows. With one or two exceptions, the standard and number of exhibits were disappointing; it is considered that the time has now arrived when serious consideration should be given to the reduction in the number of Shows each year.

SALISBURY EXPERIMENT STATION

Weather Conditions. October was comparatively cool and dry until the 30th, but, from then onwards, rain was recorded on all but seven days until the end of November. First maize plantings were made on the 7th November and ideal planting weather persisted until the end of the year. Thus almost all crops were sown earlier than usual, an important factor in view of the abnormally low total rainfall for February, which, coming at the most important "cobbing" stage in the life of the maize plant, must have limited yields of that crop to some extent.

Station trials continue to provide evidence of the great value of animal manures and the need for husbanding all available resources for farm crops. A comparison of rotations M1 and M2, both four-year rotations having the same cropping sequence, show that an application of eight tons of kraal compost once in the four-year period has increased the average yield of maize in system M2 by 6.20 bags per acre. (Cropping sequence = maize, groundnuts, maize, velvet beans for green manure.) In addition the groundnut crop has benefited by several bags each year. The use of all crop residues, such as maize stover for making kraal compost allows the return of between 1¾ and 2 tons of the compost per acre per annum to all arable land on the station.

Maize. A number of inbred lines, at present used as parents in double hybrids being grown commercially, have weaknesses which make their replacement desirable as soon as possible. With this in view, the testing of all lines in an advanced stage of inbreeding for specific combining ability with the single hybrid N3-1-4-9 x A5-7-6 has been considered of primary importance, and was carried a stage further forward this year. On the basis of the mean yields in the 1955-56 and 1956-57 trials it is proposed to bulk the lines SC5516, SC5522 and SW55167 for commercial use. Altogether six lines, in three-way crosses with N3-1-4-9 x A5-7-6, outyielded the tester parent over the two seasons, indicating that they should combine to make new double hybrids capable of yields equal to N3-1-4-9 x A5-7-6, a considerable advance on the performance of the present commercial hybrids. The lines mentioned above were chosen because they appear to have other desirable characters, such as resistance to *H. turcicum*, as well as good combining ability.

In addition the 1956-57 yield trials included the first testing of certain AH, AS and AZ lines, the tester parents being the open-pollinated variety Southern Cross and a multiple hybrid. A number of these test crosses outyielded the standard single hybrids 50H35 and 51H37, an encouraging result which suggests that new sources of high general combining ability may be found amongst this material. All the more promising of the lines introduced from Natal and South and Central America in 1955, and since selfed on the Station, were crossed on to N3-1-4-9 x A5-7-6 and will receive their first test in 1957-58.

In spite of the poor growth in all late planted maize it was possible to make the first back-crosses in the project designed to develop a more blight resistant version of the line A5-7-6. A further series of back-crosses was made in the development of male-sterile counterparts of four inbred lines and these will receive both a first bulking and a first testing to measure any changes in combining ability brought about in transferring the male-sterile character to them, in 1957-58.

Because of staff shortage it was not possible to extend the yellow maize nursery. This was restricted to the maintenance of, and selection within, introduced lines from various countries.

After two seasons in which the reduction in yield from a severe attack of leaf blight *(H. turcicum)*, rated 3.5 on the Beltsville scale at the end of the season, was found to be 30 per cent., the 1956-57 trial had to be abandoned because of severe distortion of the foliage in the plots sprayed to protect them from the disease. The use of an experimental spreader was held responsible for this. To supplement the information from this trial, an experiment was initiated to measure the effect on grain yield of a number of defoliation treatments carried out at two stages in the growth of the plants. In this experiment the control yielded 27.64 bags per acre and the losses from the defoliation treatments were as follows:—

Time of Defoliation	3 *Upper*	6 *Upper*	3 *Lower*	6 *Lower*
At flowering stage .	1·88	6·51	·58	1·46
3 weeks after flowering	·18	4·45	1·13	1·92

L.S.D. = 2·2 B.P.A.

Of the defoliation treatments being tested, the two involving the removal of the six upper leaves alone have reduced yields significantly. The variety of maize used was the single hybrid N3-1-4-9 x A5-7-6. As this has only a moderate degree of resistance to leaf blight, it is proposed in due course to substitute a more resistant variety and so eliminate a factor which may be complicating the true effects of defoliation.

Unfortunately the effect of the removal of the suckers or tillers once again could not be measured owing to the abnormally cool weather in the early part of the season and the consequent small amount of tillering. In those seasons in which desuckering was carried out the effect on yield was extremely small and in no instance significant. The following were the yields obtained from the other treatments in this trial:—

YIELDS IN BAGS OF 200LB. PER ACRE.

	A	B	C	D
Season 1956–57 . .	28·08	25·70	21·46	26·14
Mean of previous 5 seasons	26·88	25·13	21·63	24·50

A = Control.
B = Removal of tassels and 3 top leaves at flowering.
C = Stalks cut above ears 15 weeks after planting.
D = Stalks cut above ears 18 weeks after planting.

The population x fertilizer trial laid down in 1955-56 was continued with the following results:—

YIELDS IN BAGS OF 200LB. PER ACRE

Nitrogen	3 ft. x 18 ins.	3 ft. x 15 ins.	3 ft. x 12 ins.	3 ft. x 9 ins.	Mean
Nil	21·00	24·12	24·46	23·02	23·15
250 lb. S/A . . .	24·42	27·46	28·12	30·62	27·65
500 lb. S/A . . .	25·62	28·92	31·02	31·32	29·22
Mean	23·68	26·83	27·87	28·32	

This trial will be continued over a period sufficient to cover a range of seasons and give a true mean of the response to varying population rates.

In the maize fertilizer trials the response to phosphates was a little lower than in recent years, the response to 200 lb. of Muriate of Potash a little over three bags an acre, and the response to nitrogen, applied to the second successive maize crop following a leguminous green manure, greater than previously recorded on this station. The yields in the nitrogen trial are given:—

YIELDS IN BAGS OF 200LB. PER ACRE.

Nil N.	50 lb. N. @ 6W	100lb. N @ 6W	50lb. N. @ P	100lb. N. @ P	50lb. N. @ P + 50lb. N. @ 6W	Mean
12.97	20.63	25.10	22.17	24.52	26.59	22.00

P = Planting; 6W = six weeks after planting.

In this year's trial sulphate of ammonia was compared with urea; as there were no significant differences in the response to the two forms, the figures given are means. It is thought that the

abnormally cool wet weather, experienced in November and early December, may have been responsible, or partly responsible, for the unusually high response to the applications made at planting.

In recent years a number of factors have made the growing of heavy crops of leguminous material for ploughing under as green manure increasingly difficult. A possible alternate method of maintaining fertility in maize rotations is to use the maize stover as the source of organic matter and supply the necessary nitrogen as inorganic fertilizer. To measure the effect of various ways of using the maize stover, a trial was laid down in 1954 with the following results.

YIELDS OF MAIZE IN BAGS OF 200 LB. PER ACRE.

A	B	C	D	Mean	Season
29·40	31·29	27·07	31·10	29·71	1956–1957
20·15	21·35	19·69	22·46	20·91	Mean 1954–55 & 55–56

A = Control, stalks removed.
B = Stalks ploughed under.
C = Stalks stubble mulched.
D = Stalks removed and 2 tons of kraal compost returned to land.

In all four systems 100 lb. of nitrogen per acre is applied each year. The substantially higher yields in 1956-57 are attributed chiefly to the substitution of a more blight resistant and higher yielding hybrid for that used in the previous seasons. In previous seasons it was apparent that blight began to develop earliest in the stubble mulched plots, where the stover from the previous crop acted as an ideal reservoir of infection. Possibly, therefore, the yield of the stubble mulch plots was affected to a greater extent than that of the other treatments, and it was to eliminate this possibility that the more blight resistant hybrid was used this year with complete satisfaction. Up to the present, ploughing the stalks under has given better results in this trial than leaving them as a mulch on the surface.

Legumes. A further manurial trial with sunn hemp was unsuccessful in discovering any fertility factor substantially limiting the growth of this crop. No significant increases in the weight of green material were obtained from applications of organic matter, either in the form of kraal compost or maize stover. Nor was there any response from an application of lime, at the rate of 1,500 lb. per acre, in conjunction with a number of minor elements, or to nitrogen, at the rate of 200 lb. of nitrate of soda per acre. In previous trials no response was obtained to phosphates, potash or lime, and in the coming season it is intended to investigate factors, such as time of planting and the effect of nematodes, and to discontinue fertilizer trials for the time being.

Planted in mid-December the yield of seed from soya bean varieties ranged from 6.44 to 7.33 bags per acre. It is thought that the lack of rain in February was responsible for limiting yields in this trial. Elsewhere on the Station, soyas sown a fortnight earlier made magnificent growth, and if left to mature for seed would probably have given considerably higher yields. Whilst cowpeas again grew very poorly, velvet beans made satisfactory growth and can still be used on this station as an alternate green manure crop.

Wheat. The 1956-57 summer crop, sown on the 6th and 7th of December, looked most promising but finally give disappointing yields. This may have been due to a lack of rain at a critical stage and, in some instances, to an unusually severe attack of leaf rust *(P. triticina).* In a trial, which included 12 varieties or strains, the highest yield of 8.4 bags an acre was obtained with a selection from one of the Angola varieties. The next highest yield was from a hybrid between two North American varieties. Other Angola varieties did comparatively well and proved their adaptability to Rhodesia conditions for the fifth successive summer.

The winter crop was sown under irrigation on the 29th and 30th of April on land which had been green manured with sunn hemp during the summer. In a few cases, a somewhat poor stand was obtained, apparently because of dormant seed as a result of the short period between harvesting and planting. A yield trial was conducted with eight varieties, the standard winter variety Punjab 8A giving the highest yield of 15.9 bags per acre. Next, at 15.3 bags per acre, was a new Kenya variety, 354P, which was highly rust resistant during the summer. From Kenya, however, it is reported as having been attacked by new races of stem rust. The Angola varieties are not particularly promising for winter planting under highveld conditions.

Potatoes. Potato experiments included a yield trial with 20 varieties, a fertilizer trial with three levels of N, P and K, and a number of plots of seedlings bred by Dr. J. E. Van der Plank at Pretoria.

Early growth of the crop was vigorous but Late Blight *(Phytophthora infestans)* appeared unusually early, on December 4th, and caused severe reduction in yields of susceptible varieties.

In the yield trials Robijn (Dutch Robyjin) gave the highest yield with 123 x 150 lb. bags per acre, followed by Voran and Pimpernel with 107 and 101 bags per acre respectively. These three varieties exhibited good resistance to Late Blight. Furore, Regent, Alpha and Gineke did not show such good resistance, especially Alpha, but all yielded over 70 bags per acre. Tedria and Kennebec, susceptible to Blight, gave 51 and 52 bags per acre, Up-to-Date and Pentland Ace, both highly susceptible, 14 and 7 bags per acre respectively.

It was concluded that the field resistant types originating from Holland, such as Pimpernel and Robijn, constituted the most promising answer to the problem of Late Blight, and further introductions on that basis would be made.

The variety Voran was used in the fertilizer trial, but although growth was satisfactory, no significant response to N, P or K was apparent.

HORTICULTURE

A fairly good year was experienced in the horticultural industry. For the second year in succession only light to moderate ground frosts occurred which did more good than harm. No hail damage to horticultural crops was recorded. Citrus trees cropped well and deciduous ones fairly well. Mashonaland experienced heavy mid-summer rains with consistent overcast weather which severely affected vegetable production.

Whilst the standard of production by the more expert producers is favourable, a need exists for greater advisory services to guide and assist the less experienced growers. Except in the Eastern Districts, where two advisory horticulturists are stationed, the rest of the Colony was still dependent on what sparse attention could be afforded by the Senior Horticulturist stationed in Salisbury.

The drift in and out of fruit and vegetable growing as a side line by farmers continued, but such production lacks the stability for consistent production and regular output, required to offset continued heavy importation. The opening of the new Cashel canning factory has given a considerable stimulus to the surrounding area.

The 14 day visit of the two Union Government Horticulturists to investigate the potentialities for the production of horticultural crops, with special reference to the Eastern Districts, was of value to the industry and to growers.

Citrus. Very favourable weather conditions for citrus brought about increased cropping and better quality fruit. Except during mid-winter, all fruit was readily disposed of locally. Quantities of orange juice concentrate were exported. The emphasis today is on orange and naartjie growing and extended planting was continued, limited only by the lack of sufficient trees.

Trace element deficiency diseases—especially zinc and manganese—were still very common and represent the chief limiting factors to increased orange yields and longer lived trees. Fortunately, the trouble is readily corrected and at small expense. In sandy soils, several instances of advanced magnesium deficiency were found, especially in the Umvuma area.

Production. Sales of Southern Rhodesia citrus for 1955-56 including fruit used for processing by the Citrus Estate were:—

	Cases of 75—85 lb.
Oranges	280,988
Lemons	13,363
Grape Fruit	4,677
Other	5,983
Total	305,011

(The 1954–55 figures were 252,121 cases.)

For the year 1955-56, the declared number of citrus trees in Southern Rhodesia was:—

	Bearing	*Not bearing*	*Total*
Orange	130,818	102,788	233,606
Lemon	23,453	7,366	30,819
Grape Fruit	7,495	11,201	18,696
Other	8,083	14,542	22,625
Total	169,849	135,897	305,746

(The 1954–55 total was 249,044.)

Sub-tropical Fruit. With a second season of no serious frosts, young trees enjoyed good growing conditions, and became well established. While increased planting has taken place, sub-tropical fruit production has not kept pace with local requirements.

Bananas. There has been little expansion of new plantings partly due to high transport costs to railhead and keen competition from wholesalers in Portuguese East Africa who supply Rhodesian merchants in quantity.

Trial consignments of Cavendish fruit from Nyasaland African growers were received in Salisbury. Speedier transport and the guarantee of being able to send a regular weekly supply are necessary if this venture is to succeed.

Pawpaws. New plantings show a considerable increase since the previous year. Fruit grown in the highveld areas give a greatly extended season of supply. Standard packs have only been used in Matabeleland to a small extent.

Avocados. The high price and limited supply of budded nursery trees from South Africa is now being eased by local propagation and a marked increase in plantings should soon result. Fuerte has proved the best cropping variety and is well suited to Rhodesian conditions.

Pineapples. The crop is still of minor importance but production could be increased in several areas if the crop were afforded good treatment. Small additional plantings of the Queen variety, which is the one chiefly grown, were made during the past season.

Granadillas. With the discontinuance of processing this fruit for juice extraction, granadillas were diverted to fresh fruit markets, which are limited.

Sub-tropical Fruit Trees (excluding citrus). In 1955-56 the recorded total of trees in Southern Rhodesia was:—

	Bearing	*Not bearing*	*Total*
Pawpaw	18,472	22,342	40,814
Avocado	3,082	4,975	8,057
Mango	13,464	6,481	19,945
Guavas	11,453	5,463	16,916
Other	1,081	2,552	3,633
Total	47,552	41,813	89,365

(The 1954–55 total was 76,683.)

Deciduous Fruit. A further year of only light winter frost has been less beneficial to deciduous fruit trees, which lacked the stimulus of a colder resting period.

Blossoming was later, more irregular (where not sprayed with D.N.O.C.) and apple crops in particular were only fair. The importance of humidity at flowering time and its bearing on fruit setting is well illustrated by Methley plums, which flowered well last year but failed to set fruit, owing to a spell of dry winds during the flowering period.

Control on the importation of plums from South Africa was introduced last season and no imports were permitted until toward mid-December when the bulk of local crops, except Satsumas, had been disposed of.

With the two canning factories in operation at Umtali and Cashel, it is expected that more fruit will be diverted to these factories by growers who formerly supplied the fresh fruit market. More plantings of Kakamas cling peach trees were made.

Deciduous Fruit Trees. The recorded totals for the year 1955-56 were:—

	Bearing	*Not bearing*	Total
Apple	24,476	36,131	60,607
Peach	30,782	22,852	53,634
Plum	10,239	9,560	19,799
Pear	2,522	4,020	6,542
Apricot	2,716	4,580	7,296
Other	7,227	21,323	28,550
Total	77,962	98,466	176,428

Some older orchards have been scrapped and grass fires have caused a few losses of fruit trees.

Grapes. Interest in grape growing both for table and for wine making continued to increase and, while still in the experimental stage, results indicate that promising crops are possible from many areas of the country. Early varieties of table grapes sold well.

Coffee. The recorded acreage is 36 of which only eight are in bearing. These plantings exist in the Umtali, Cashel, Melsetter and Chipinga areas. Only moderate interest is taken in coffee growing at present.

Fruit Importation. Importation was considerably greater than in past years; increase in consumption is far outstripping home production of fresh fruit other than oranges.

Federal imports for 1956 were:—

Deciduous Fruit	259,234
Bananas	113,737
Grapes & Miscellaneous	63,685
Other sub-tropical	38,801
Citrus	19,529
Total	£494,986

Vegetables. The area under vegetable production increased still further to 4,779 acres. Except during the heavy summer rains, plentiful supplies of in-season vegetables were produced throughout the year in all areas except Bulawayo.

The greater use being made of overhead spray irrigation, improved drainage during the rains, and planting on ridges has resulted in better cropping. Cabbages, carrots and lettuce have responded well to such cultural practices.

Late Blight disease *(Phytophthora infestans)* destroyed crops of tomatoes in many areas and persisted until late May. The first incidence of molybdenum deficiency of brussels sprouts was seen in a crop planted between cauliflowers, which were also affected. Still larger quantities of vegetables are required for processing at the Umtali and Cashel factories.

Vegetable Imports. Fresh vegetable imports into the Federation for 1956 were 2,233 tons valued at £56,530 as compared with 2,784 tons in 1955, valued at £75,500.

Onions. Production of onions for the year 1956 totalled 283 acres and yielded 17,132 bags of 120 lb. each; this represents the largest acreage planted since 1950. The crop is being grown with confidence and improved methods have considerably increased yields per acre.

The main variety grown is Cape Flat which has a commercial storage life of approximately four months. Encouragement is being given to earlier season production, for harvesting in August and September, as long as keeping onions have not been grown successfully.

Import control was fully implemented for the four months October to January. For 1956, Federal imports were 56,760 bags valued at £55,026.

Seed Production. Good progress was made with seed production and the formation of the Rhodesian Vegetable and Flower Seed Association, with the machinery for producing certified seed, is well merited. Large trial plantings of several varieties of green peas from England gave promising results. More annual flowers were grown for seed. The production of certified seed will reduce very considerably the necessity for importing seed which, for the Federation, was valued at £50,000 in 1956.

Nursery Planting Material. Local nurseries can only supply a very small proportion of the requirements of growers. In 1956 the value of imported planting material increased to £61,000.

Advisory Services. Requests for advisory services and specialized visits had to be restricted owing to lack of staff. Follow up visits were rarely possible.

At various field days, public meetings and gatherings, demonstrations, talks and lectures on various horticultural subjects were given in many parts of the country; these included six lectures on fruit and vegetable production and marketing to senior students at the Gwebi Agricultural College.

Agricultural Shows. The Senior Horticulturist judged fruit, vegetables and flowers at agricultural and horticultural shows held at Bindura, Sinoia, Lusaka, Inyanga, Salisbury, Gatooma, Rusape, Bulawayo and various Young Farmers' Club shows and competitions. At most shows the fruit and vegetable exhibits were far less than usual. Fruit educational exhibits were staged at the Salisbury, Inyanga and Bulawayo shows. The Senior Horticulturist served on various departmental committees.

RHODES INYANGA ORCHARDS

Climatic Conditions. Total rainfall was 52.56 inches with rain occurring on 129 days. December was the wettest month when 13 inches of rain were recorded. The spring and early summer months were much drier than usual. For the year the mean daily hours of bright sunshine were 7.1. Frosts were light. The lowest temperature, 16.4° F. occurred in May.

The Fruit Crop. For the current season, fruit sales totalled £1,385. While the apple crop was light, Bon Chretien pears cropped heavily. Other than local sales, all fruit was sold through the Inyanga Fruit Growers Association's marketing system.

Fruit Tree Behaviour. Following two seasons of only light frost of short duration, abnormal fruit tree behaviour has been most marked, with delayed foliation and patchy, prolonged blossoming being very pronounced. The effect of D.N.O.C. (dinitro-ortho-cresol) spraying of apple trees five-six weeks before the commencement of blossoming, as compared with unsprayed control trees, has shown that while climatic conditions are not ideal for apple growing, their effects can be considerably mitigated by tonic spraying to stimulate more normal behaviour. No carry-over stimulating effect was apparent on trees sprayed the previous year followed by no spraying. Plum varieties, Beauty and Santa Rosa, showed no response to such spraying.

Fruit Tree Nutrition. The nitrogen and magnesium experiments, using the apple varieties Rhode Island Greening, White Winter Permain and Ohinemure, are being continued and another season is expected to elapse before definite results will be obtained.

With the foliar application experiments of various kinds, a response to magnesium sulphate occurred with the Versfeld apple variety. This work is being followed up.

Recording Work. Blossom and yield recording, together with the behaviour of newly introduced varieties was continued.

Soil Management. In Block 9 the central portion has been uncultivated since January 1955 to investigate the effect of permanent sod on apple trees as against those of similar varieties alongside cultivated in autumn and winter. No significant differences have occurred to date.

Chilean Red Clover in Block 3 has grown quite well and some self seeding has taken place. It has been possible to irrigate one half the area and the adjoining apple trees, as well as some Kakamas peach trees, to make a comparison with trees which received no irrigation.

Cider Experiments. Small quantities of cider were made from dessert and culinary apples with fair success. Details of gravities and techniques have been recorded. From next season small crops from the English cider varieties will be used.

Apple Mildew Control. In conjunction with the Plant Pathology Branch, a trial of four fungicides, Kolodust, Kolofog, Karathane and lime sulphur for the control of apple mildew

disease gave a most favourable response from the trees treated with Kolodust. The experiment is being repeated for a second season.

General. With the opening of more schools in the area, little youthful African labour is available. Female labour was employed during the harvesting season.

Additional apple and peach trees of several varieties were planted for extended variety trial behaviour. Some difficulty was experienced with grasshoppers attacking dormant buds of young apple trees. More fencing was erected to protect young trees from buck.

2. ANIMAL PRODUCTION

J. C. RAATH

CHIEF ANIMAL HUSBANDRY OFFICER

The year under review was another successful year for cattle production. Rainfall was adequate and fairly well distributed. Cattle maintained reasonably good condition during the dry season.

THE BEEF INDUSTRY

Below are given the figures for total cattle numbers in the Federation as well as some details of the European owned cattle population in Southern Rhodesia.

TABLE I.

NO. OF AFRICAN AND EUROPEAN OWNED CATTLE IN THE FEDERATION (IN THOUSANDS).

Year	Federal State		Southern Rhodesia		Northern Rhodesia		Nyasaland	
	European owned	African owned	European	African	European	African	European	African
1952	1,332	2,860	1,200	1,787	121	804	11	269
1953	1,337	2,937	1,197	1,832	129	843	11	262
1954	1,367	2,988	1,227	1,850	130	855	10	283
1955	1,381	3,069	1,246	1,901	125	871	10	297
1956	1,493	3,110	1,344	1,910	139	872	10	308

TABLE II.

EUROPEAN OWNED CATTLE IN SOUTHERN RHODESIA.

Year	Total number	Number of cows	Number of Calves	Total Losses
1952	1,199,576	400,918	188,825	54,715
1953	1,196,570	411,829	192,778	62,486
1954	1,227,066	430,071	207,196	57,251
1955	1,246,254	449,306	206,746	65,043
1956	1,344,136	485,926	235,071	54,846

A substantial increase took place in the total cattle population of the Federation during 1956. In Southern Rhodesia, which constitutes the main cattle producing area of the Federal State, an increase of 7.9 per cent. in the total European owned cattle population was particularly encouraging. Considerable increases were also recorded in the number of cows and calves, while losses remained at a satisfactory low level.

Supplies of Slaughter Cattle. The following figures indicate the total supplies of slaughter cattle from European and Native sources in Southern Rhodesia and Northern Rhodesia, but excluding cattle slaughtered for consumption in African areas.

TABLE 3.

TOTAL SUPPLIES OF SLAUGHTER CATTLE.

Year	Number Slaughtered Southern Rhodesia	Average C.D.W.	Number Slaughtered Northern Rhodesia
1952	238,944	413	34,895
1953	227,923	423	34,584
1954	256,271	423	24,773
1955	259,666	420	31,262
1956	237,069	424	30,561

TABLE 4.

NUMBERS AND GRADES OF BEEF CATTLE SLAUGHTERED IN THE CONTROLLED AREAS OF SOUTHERN RHODESIA FOR THE YEAR ENDING 30TH SEPTEMBER, 1957.

A. COMBINED TOTALS FOR COLD STORAGE COMMISSION PLANTS.

Grade.	Oxen	Cows & Heifers	Bulls	Total
Rhodesia Best	2,247	188	—	2,435
Imperial	7,198	362	—	7,560
Standard A.	31,476	1,374	—	32,850
G.A.Q.	34,238	13,376	—	47,614
F.A.Q.	14,803	7,132	—	21,936
Compound	14,458	8,460	1,873	24,741
Inferior	1,868	5,707	258	7,834
Totals	106,289	36,600	2,081	144,970

TABLE 5.

B. COMBINED TOTALS PRIVATE BUTCHERS.

Grade	Oxen	Cows & heifers	Bulls	Total
Rhodesia Best	362	21	—	383
Imperial	1,681	107	—	1,788
Standard A	4,084	534	—	4,618
G.A.Q.	5,434	3,153	—	8,587
F.A.Q.	2,617	2,000	—	4,617
Compound	2,827	2,957	733	6,517
Inferior	252	2,026	23	2,301
Total	17,257	10,798	756	28,811

TABLE 6.

C. GRADE PERCENTAGES OF CATTLE SLAUGHTERED IN CONTROLLED AREAS.

Grade	C.S.C.		Private Butchers		Total	Total
	Total	%	Total	%	1957	1956
Rhodesia Best	2,435	1·68	383	1·33	2,818	3,663
Imperial	7,560	5·21	1,788	6·21	9,348	11,708
Standard A	32,850	22·66	4,618	16·03	37,468	38,526
G.A.Q.	47,614	32·85	8,587	29·80	56,201	49,978
F.A.Q.	21,936	15·13	4,617	16·02	26,553	15,371
Compound	24,741	17·07	6,517	22·62	31,258	18,045
Inferior	7,833	5·40	2,301	7·99	10,135	6,107
Totals	144,970		28,811		173,781	143,398

A decrease was recorded in the total number of cattle slaughtered during 1956 (see Table 3). This was mainly due to producers holding back cattle in anticipation of a price increase as a result of the Turner Commission recommendations. During 1957 supplies of slaughter cattle were well maintained as indicated by the numbers of cattle slaughtered in controlled areas. As a result of the decision of the Cold Storage Commission not to freeze beef and the improved seasonal price relationships, supplies of fresh beef were well distributed throughout the year and rationing of beef was unnecessary.

There was a marked decrease in the number of higher grades of cattle coming on to the market in the controlled areas, but a substantial increase in G.A.Q. and lower grades. No changes were made in the retail marketing of beef and a reasonably strong demand was evident for the higher grades of beef. It was, however, found difficult to sustain consumer interest in the higher grades of beef because, particularly towards the end of the year, these grades were in very short supply.

The Cold Storage Commission slaughtered 931 calves, and private butchers 8,960. A total of 1,102 immature male stock and 1,886 potential breeding stock were slaughtered at control centres, which represents a decrease on the previous year.

Prices of Slaughter Cattle. The cost of production figures for beef increased by 3.2 per cent. A proportion of this increase was used to lengthen the high price period during the off season because experience during the previous year indicated that prices started to decline too early, resulting in supplies not coming forward as required. The balance of the increase was applied equally on a percentage basis over all grades. The following price schedule came into operation on 1st April, 1957:—

TABLE 7.

PRICES OF BEEF PER 100 LB. C.D.W.

Period Commencing	Rhodesia's Best per 100 lb.	Imperial per 100 lb.	Std. "A" per 100 lb.	G.A.Q. per 100 lb.	F.A.Q. per 100 lb.	Compound per 100 lb.	Inferior per 100 lb.
1957							
April 1	140s.	130s.	120s.	105s.	94s.	80s.	62s.
8	139s.	129s.	119s.	104s.	94s.	80s.	62s.
15	138s.	128s.	118s.	103s.	94s.	80s.	62s.
22	138s.	128s.	118s.	103s.	94s.	80s.	62s.
29	138s.	128s.	118s.	103s.	94s.	80s.	62s.
May 6	138s.	128s.	118s.	103s.	94s.	80s.	62s.
13	138s.	128s.	118s.	103s.	94s.	80s.	62s.
20	138s.	128s.	118s.	103s.	94s.	80s.	62s.
27	138s.	128s.	118s.	103s.	94s.	80s.	62s.
June 3	138s.	128s.	118s.	103s.	94s.	80s.	62s.
10	138s.	128s.	118s.	103s.	94s.	80s.	62s.
17	138s.	128s.	118s.	103s.	94s.	80s.	62s.
24	138s.	128s.	118s.	103s.	94s.	80s.	62s.
July 1	138s.	128s.	118s.	103s.	94s.	80s.	62s.
8	139s.	129s.	119s.	104s.	96s.	80s.	62s.
15	141s.	131s.	121s.	107s.	97s.	81s.	62s.
22	143s.	133s.	123s.	109s.	98s.	83s.	62s.
29	147s.	137s.	127s.	113s.	99s.	85s.	62s.
Aug. 5	151s.	141s.	131s.	117s.	100s.	87s.	62s.
12	156s.	145s.	135s.	121s.	104s.	89s.	62s.
19	158s.	147s.	137s.	123s.	106s.	90s.	62s.
26	161s.	150s.	140s.	126s.	109s.	91s.	62s.
Sept. 2	163s.	152s.	142s.	128s.	111s.	93s.	62s.
9	165s.	155s.	144s.	130s.	114s.	95s.	62s.
16	168s.	158s.	146s.	132s.	116s.	97s.	62s.
23	172s.	162s.	148s.	134s.	119s.	99s.	62s.
30	176s.	166s.	150s.	136s.	121s.	101s.	62s.

Nature of Present Production. National statistics for 1956 indicate that the present cattle population of the Federation is approximately 4,600,000 head. Of these approximately 3,100,000 are African owned and 1,500,000 are European owned. Estimates of production from these cattle are of the order of 140 million pounds of beef per annum. Of this total weight of beef approximately 50 per cent. originates from European producers and 50 per cent. from the Africans.

It is only possible to obtain accurate trends in production for the European owned cattle. These trends include the following characteristics:—

(a) Natural Increase—16-17 per cent. per annum.

(b) Slaughter rate—10-11 per cent. per annum.

(c) Mortality—5-7 per cent. per annum (depending on seasonal conditions).

On this basis only a moderate expansion of production is possible. The rate of expansion has been assisted over the last five years by particularly favourable seasons and could be disturbed by any major natural hazard such as drought.

A more detailed analysis of the production trends indicates that there has been no increase in the fertility of the beef breeding herds over the past ten years. Similarly, mortality has showed no significant changes and appears to be directly related to the favourability of the season. Probably due to increased demand for beef during this period, the slaughter rate has increased from 8 to 11 per cent. It is obvious that any further increase in the slaughter rate of the existing cattle population can only result in a decrease in numbers unless it is accompanied by a corresponding increase in the rate of natural increase.

Demand for Beef. The market indicates that the country is approaching self sufficiency in beef production, as determined by the present purchasing power of the population and the present methods of marketing. The main feature of the present marketing system is the purchase of large quantities of beef for a large section of the consuming public on a contract basis where no specifications are laid down for quality. The per capita consumption of beef in this country is 50 lb. per annum. Beef supplies approximately 70 per cent. of the total animal protein consumed by the human population. On a nutritional basis the total animal protein produced in the country provides approximately 50 per cent. of the human requirements. A large numerical expansion in the human population is expected as well as a steady increase in purchasing power of the African population. It is clear from these facts that a considerable increase in beef production is required.

Expansion in Production. The present production of beef is based almost entirely on the natural veld grazing. On European farms the nature of the production from veld is summarized below:—

Calving rate (survival)—50 per cent. at weaning.

Mortality—5-7 per cent.

Average carcase weight (steers)—525 lb. (moderate finish).

Average carcase weight (all cattle)—480 lb.

The present production pattern in the African areas is that approximately 67 per cent. of the total cattle sold are mature slaughter stock. The balance consists of young male and female stock which find their way to the European areas for growing out. As a result of the poor nutritional conditions in the Reserves, slaughter stock only mature from seven years upwards and invariably these cattle are only suitable for the lower grades of beef. It is doubtful whether this is the correct system of production in Reserves. With their small herds they are only capable of maintaining a minimum number of cows. Protein is seriously deficient in the Reserves and selling young stock and keeping more cows would give the African family a better opportunity for providing its protein requirements from milk production.

It is considered that expansion can take place in the following ways:—

(a) *Numerical Expansion:* There is considerable possibility for expansion numerically of beef cattle in the Federation using existing methods of production. The principal sources of this increase are:—

(i) New producers in the high rainfall areas of Southern Rhodesia and throughout the European areas of Northern Rhodesia.

(ii) Higher slaughter rate of cattle from the African areas of Northern Rhodesia (at present only 3 per cent. slaughtered).

It is quite likely that a certain amount of this increase will be balanced by a necessary reduction of the overstocked Reserves in Southern Rhodesia.

(b) *Nutrition:* The main limitation to higher beef production over the major portion of the Federation is the low level of nutrition during the dry season. Experimental evidence indicates that calving rates, mortality and growth can be favourably influenced by the provision of economic winter maintenance. In addition, this will provide considerable scope for numerical expansion on established farms by an overall increase in carrying capacity.

Research completed during the year at the Henderson Research Station indicated great possibilities for the development of low cost maintenance rations. Producers have been actively encouraged to maintain cattle for the off season on economic maintenance rations rather than to fatten on a high level on expensive rations. The evidence so far appears to indicate greater profitability in maintenance feeding than in fattening.

Production Methods in relation to Future Market Requirements. Beef production is a long term enterprise and consequently in planning production, it is necessary that producers should be assured of a stable market, preferably in the form of a guaranteed price.

Prior to the Turner Report the beef industry subsidized itself by using the profit on the lower grades to maintain relatively higher prices for the better grades of beef.

Since maximum freedom was given to the market by the removal of controls and the termination of the agreement between the Native Department and the Cold Storage Commission this policy could no longer be maintained.

Under the new circumstances the Cold Storage Commission is expected to carry the Government guaranteed price. With the present emphasis in demand on the lower grades and the ever increasing prices obtained for these low grade cattle on the open market, it has been difficult to maintain prices for better quality beef above that which an undiscriminating market is prepared to pay.

It is essential for the industry to maintain reasonable price differentials between the grades, determined largely by differences in age, in order to supply an incentive for the production of younger slaughter stock with a moderate finish, because this offers the best possibility of expanding production. It is also necessary to maintain seasonal price differentials in order to encourage production during the annual periods of scarcity. The present demand for low quality beef has been used as a political instrument to obtain higher prices for the lower grades of cattle and to confuse the planning of a progressive and expanding beef industry. Emphasis has been placed consistently on the advantages the African producer obtains from the free market, but no representation has been made on behalf of those Africans who are unfortunately the consumers of low grade beef at higher prices.

It is considered that the beef industry is basically sound and has a bright future provided a determined policy to encourage younger and leaner beef is followed, while producing a small quantity of high quality for a more selective but limited clientele.

PIGS

The following table gives the total number of European owned pigs over the past five years.

TABLE 8.

Year	*Southern Rhodesia*	*Northern Rhodesia*
1952	64,015	8,000
1953	74,113	9,000
1954	64,090	9,000
1955	53,187	10,000
1956	50,195	13,000

TABLE 9.

PIGS SLAUGHTERED AND GRADED IN THE CONTROLLED CENTRES OF SOUTHERN RHODESIA.

A. PIGS SLAUGHTERED FOR THE C.S.C.

Grade	Baconers		Porkers		Cutters	
	No.	%	No.	%	No.	%
A	28,728	75·92	7,373	52·71	2,781	37·51
B	4,374	11·55	2,118	15·14	1,368	18·46
C	1,638	4·33				
L	894	2·36	126	·90	38	·51
X	2,118	5·61	3,965	28·35	3,075	41·46
Inferior	87	·23	406	2·70	153	2·06
Total	37,839		13,988		7,415	

TABLE 9 (continued.)

Grade	Underweight pigs		Manufacturing pigs		Overweight pigs		Boars	
	No.	%	No.	%	No.	%	No.	%
A	—	—	2,199	80·70	—	—	195	84·78
B	152	16·61	432	15·85	311	99·68	—	
C					1	·32		
L	10	1·09						
X	471	51·48						
Inferior	282	30·82	94	3·45			35	15·22
Total	915		2,725		312		230	

TABLE 10.

B. PIGS SLAUGHTERED AND GRADED FOR PRIVATE BUTCHERS.

Grade	Porkers		Cutters		Underweight pigs	
	No.	%	No.	%	No.	%
A	4,339	28·50	266	3·84	—	—
B	1,204	7·91	144	2·08	438	16·45
L	60	·39	10	·15	11	·41
X	8,047	52·86	3,814	55·19	1,391	52·24
Inferior	1,574	10·34	2,677	38·74	823	30·90
Totals	15,224		6,911		2,663	

Although European owned pigs in Southern Rhodesia still showed a decline at the end of 1956, unpublished information on breeding stock at the end of September 1957 appears to indicate a moderate increase in sow numbers. The number of pigs slaughtered during 1957 also increased as indicated by the figures for pigs slaughtered in the controlled areas.

In Northern Rhodesia production has increased consistently over the past five years. No changes were made in the grading system during the year.

Prices and Marketing. The maximum and minimum prices for pigs remained the same as during the previous year. Discussions between the Pig Co-op and the Cold Storage Commission resulted in the termination of the agreement between these organizations. A new Central Co-op was established to take over all processing of pig products from the Cold Storage Commission on the 1st July, 1957. The Central Co-op is leasing the premises and other facilities from the Cold Storage Commission.

Litter Testing. The litter testing station has completed its first full working year. Twenty groups of four pigs each have completed their test. Out of a total of 70 applications received from breeders for admission of litters for testing 33 were cancelled. Mastitis has been one of the main causes of cancellation. The tests which have been completed to date have yielded interesting information. The average conversion ratio for all completed groups has been 3.38 lb. of feed for the production of 1 lb. gain in liveweight which compares very favourably with feed conversion ratios elsewhere.

SHEEP

The following table gives the number of sheep owned by Europeans in Southern and Northern Rhodesia.

TABLE 11.

Year	Number owned *Southern Rhodesia.*	Number owned *Northern Rhodesia*
1952	115,588	7,000
1953	105,970	6,000
1954	108,574	10,000
1955	106,483	13,000
1956	118,281	14,000

Sheep numbers increased considerably during 1956. In Southern Rhodesia 47,200 sheep were slaughtered compared with the 36,300 in the previous year. Interest in sheep farming is developing on a wider basis every year, but no large scale expansion can be expected until greater intensification of farming takes place.

GENERAL

Close co-operation was maintained with the extension and advisory services. The specialized Animal Husbandry Officers, appointed last year, have given valuable assistance on an extensive scale to the advisory services, and livestock producers.

3. THE DAIRY INDUSTRY

R. G. JONES

Chief Dairy Officer

The season under review has been a comparatively good one, except for the Eastern Districts, and the high level of production attained particularly during the winter months indicates continued progress as regards feeding and management of dairy herds. Whilst improved management can make the industry less dependent on the agricultural season, a poor season can, however, have a serious adverse effect on production.

Production of Dairy Produce. This has been another record year and the overall increase in milk production, based on preliminary figures, shows an increase of just over one million gallons. This has been largely accounted for by the increased sale of approximately 884,000 gallons of whole milk from farms to the Dairy Marketing Board. The increase in consumption of whole milk has, however, not kept pace with the increase in production, and consequently the Dairy Marketing Board have had an increased surplus for manufacture. This has been particularly noticeable in the Bulawayo and Midland areas where the sale of whole milk has shown little improvement over the previous year, yet approximately 75 per cent. of the present year's increase in whole milk received by the Dairy Marketing Board was produced in these areas.

The milk surplus to whole milk requirements was used largely for cheese manufacture although, towards the end of the period under review, increased quantities were separated for the manufacture of roller dried skim milk powder.

There was a decrease in milk supplies to the Gazaland Co-operative Cheese Factory, Chipinga, and this can be attributed to the comparatively poor season.

Dairy production figures are summarized in Table I, but they do not include the production of farm butter and farm cheese other than Cheddar cheese. As the quantity of farm butter and farm cheese produced for sale is very small their omission has a negligible effect on the production figures.

TABLE I.

Dairy Production 1920 — 1957.

Year	Butter 1,000 lb.	Cheese 1,000 lb.	Liquid Milk(a) 1,000 gallons	Total Gallons
1920	600	79	258	2,000,000
1930	1,768	163	1,008	6,100,000
1940	1,686	383	2,095	6,910,000
1945	1,224	702	3,848	7,750,000
1950	900	394	5,720	9,000,000
1951	900	467	6,045	9,505,000
1951/52	975	490	6,730	10,390,000
1952/53	964	578	7,350	11,070,000
1953/54	906	1,007	7,590	11,670,000
1954/55	1,096	1,267	7,632	12,514,000
1955/56	1,083	2,168	8,050	13,202,000
1956/57 (b)	1,387	2,055	8,580	14,300,000

(a) Milk available for use as fresh milk, fresh cream and ice cream.

(b) Preliminary figures.

The volume of milk supplied to the Dairy Marketing Board and the number of suppliers is given in Table II. It is interesting to note that in addition to the number of suppliers increasing, there was an increase in the average supply from each producer.

TABLE II.

Year	No. of Suppliers (August)	Total Milk Supplied (Gallons)
1952/53	280	5,638,000
1953/54	322	6,488,000
1954/55	364	7,817,000
1955/56	403	8,852,000
1956/57	416	(a) 9,736,000

(a) Preliminary figures.

Creameries, Butter Production and Consumption. All butter manufacture and handling of imported butter was done at three registered creameries situated at Gwelo, Salisbury and Umtali. Butter production increased appreciably as compared with the previous season, due mainly to the separation of surplus milk for the sale of skim milk to urban Africans and for the manufacture of skim milk powder. Approximately three quarters of a million gallons of whole milk were separated, the butterfat produced being equivalent to approximately 290,000 lb. of butter. Consumption of butter continued to increase and the shortfall in production was made up with imported butter (Table III). There was no difficulty in meeting the demand and the quantity imported was slightly greater than for the preceeding year:—

TABLE III.

Year	Production 1,000 lb.	Consumption 1,000 lb.	Shortfall 1.000 lb.
1945/46	1,081	1,613	532
1950/51	767	2,643	1,876
1951/52	975	3,062	2,087
1952/53	964	3,207	2,243
1953/54	906	3,232	2,326
1954/55	1,096	3,482	2,386
1955/56	1,083	3,650	2,567
1956/57	1,387	3,987	2,600

Butter was imported from the same three countries as last year in the following proportions:—

New Zealand	7·3%
Kenya	42·2%
South Africa	50·5%

There has been no change in butterfat prices during the season and the seasonal minimum prices are given in Table IV.

TABLE IV.

	1st Grade Cream	2nd Grade Cream
January — March	3/– per lb.	2/9 per lb.
April	3/10 per lb.	3/7 per lb.
May — November	4/8 per lb.	4/5 per lb.
December	3/10 per lb.	3/7 per lb.

The wholesale price of first and second grade creamery butter was reduced by one penny per lb. from April 1st, 1957, but the retail price remained the same. The prices operating from April 1st, 1957 are as follows:—

	1st Grade	2nd Grade
Wholesale	3/7 per lb.	3/5 per lb.
Retail	4/– per lb.	3/10 per lb.

All imported butter and nearly all locally manufactured butter was graded before sale and the quality was substantially the same as in the previous season (Table V).

TABLE V.

Year	% 1st Grade	% 2nd Grade	% 3rd & Below Grade
1951/52	79·6	14·9	5·5
1952/53	80·0	13·8	6·2
1953/54	78·5	13·5	8·0
1954/55	87·0	9·0	4·0
1955/56	86·6	9·8	3·6
1956/57	87·2	8·6	4·2

The slight improvement in quality can be attributed to the increased output of fresh cream from whole milk separation by the Dairy Marketing Board.

Cheese Factories, Cheese Production and Consumption. Six cheese factories operated during the season and one farm cheesemaker manufactured small quantities of Cheddar cheese. The total production of factory cheese was slightly less than during the preceeding year being 2,050,000 lb. The proportion of Gouda cheese manufacture increased with a noticeable drop in Cheddar cheese production. The proportions were as follows:—

	% of Total Manufactured 1955/56	1956/57
Cheddar Cheese	84·1	73·9
Gouda	15·6	26·0

The manufacture of Roquefort cheese continued on an experimental basis but the manufacture of a satisfactory product has not yet been achieved.

Southern Rhodesia is now self sufficient in both Cheddar and Gouda cheese due largely to the increase in milk, surplus to whole milk requirements, delivered to the Dairy Marketing Board. The Gazaland Co-operative Cheese Factory, Chipinga, produced 158,000 lb. of cheese which was slightly less than for the preceeding year, the decreased production being attributed to the poor season.

A further improvement in the quality of the cheese produced is recorded and grading figures for Cheddar cheese are given in Table VI. Difficulties were encountered, however, due to some Cheddar cheeses being heavily impregnated with mould resulting in excessive wastage and consumer complaints. The cause can be attributed largely to the high level of production during the summer season and the continued production during the winter resulting in inadequate storage facilities, and difficulty in disposing of accumulated stocks. To reduce losses through prolonged storage approximately 80 tons were exported to South Africa.

TABLE VI.

CHEDDAR CHEESE GRADINGS AS PERCENTAGE OF TOTAL CHEESE GRADED.

Year	*1st Grade*	*2nd Grade*	*3rd & Below Grade*
1949/50	90·3	7·3	2·4
1950/51	80·3	19·3	0·4
1951/52	74·8	23·5	1·7
1952/53	47·2	47·4	5·4
1953/54	47·9	13·6	38·5
1954/55	83·8	13·8	2·4
1955/56	94·9	4·2	0·9
1956/57	96·1	3·5	0·4

Accurate figures for consumption of cheese in Southern Rhodesia are not available but it would appear as if the increased sales recorded for the 1955-56 season were maintained. The anticipated increase in cheese sales to Northern Rhodesia did not materialize.

A subsidy of 6d. per lb. was paid to the Gazaland Co-operative Cheese Factory and one farmhouse cheesemaker on cheese produced.

Price control on cheese remained the same as for the previous year and applied to first and second Grade Cheddar cheese and Gouda cheese. Controlled prices were as follows:—

	1st Grade	*2nd Grade*
Wholesale	2/6 per lb.	2/4 per lb.
Retail	2/10 per lb.	2/8 per lb.

Milk Supplies. The figures in Table VII refer to milk purchased and disposed of by the Dairy Marketing Board and as they operate in the main centres of the Colony they illustrate the development of the industry.

TABLE VII.

Year	*Milk purchased* 1,000 gallons	*Surplus Milk* 1,000 gallons	*Apparent Consumption as Whole Milk & Cream*
1951/52	5,235	249	4,986
1952/53	5,638	441	5,197
1953/54	6,488	1,026	5,462
1954/55	7,817	1,876	5,941
1955/56	8,852	2,464	6,388
1956/57	9,736	3,018	6,718

The figures show that supplies of whole milk have continued to increase, and after meeting the demands of the expanding whole milk trade, leaving an increasing quantity of milk available for manufacturing purposes. It is evident that supplies required for the whole milk trade are assured, providing the industry does not suffer a serious set back due to climatic conditions or serious price reductions.

Milk Prices. The new price structure for milk supplied by producers to the Dairy Marketing Board introduced in January, 1956, continued until the 30th March, 1957. With effect from 1st April certain amendments were introduced; the "safety margin" over whole milk consumption being fixed at 83,333 gallons per month in place of 20 per cent. of the whole milk consumption, and whereas surplus milk to whole milk requirements plus safety margin was paid for at 1/9d. per gallon it is now paid for at net realization value. This is defined as the value estimated by the Dairy Marketing Board of the surplus milk and products manufactured therefrom after the deduction of all charges incurred by the Board in respect of such surplus milk and products other than the price paid or to be paid therefor by the Board to the producer. The effect of the price structure is that the producer continued to receive a guaranteed standard price for milk used for whole milk consumption plus a fixed safety margin, but the actual price paid to the producer varied monthly according to utilization.

The standard prices paid for milk of standard quality and for a quantity equal to that sold by the Board as liquid milk plus safety margin is given in Table VIII. The actual prices paid to the producers subject to the quality scheme adjustments are also detailed. The system for the payment of milk supplied to the Dairy Marketing Board on a quality basis continued and even though it involves a considerable amount of work, it is of great benefit to the industry and has ensured the continued production of good quality milk.

TABLE VIII.

Month	*Standard Price per gallon /57*	*Actual price paid per gallon /57*	*Price paid per gallon /56*
January	3/0	2/6·1	2/6·2
February	3/0	2/7·8	2/8·0
March	3/10	3/5·2	3/4·7
April	3/10	3/5·7	3/5·3
May	3/10	3/6·5	3/4·8
June	3/10	3/7·1	3/6·6
July	4/2	3/9·6	3/10·1
August	4/2	3/8·3	3/9·3
September	4/2	3/8	3/7·9
October	4/2	—	3/8·9
November	4/2	—	3/6·4
December	3/0	—	2/5·7

The retail prices for milk from 1st April, 1957, onwards were:—

	Cash	*Credit*
Delivered and undelivered milk per pint	7d.	7½d.

Fresh Cream. The sale of fresh cream continued to expand and the demand was met by local producers and the Dairy Marketing Board.

Dried Milk and Sterilized Milk. Two roller driers for the manufacture of powdered milk were installed at the Gwelo Dairy and have been in operation since March. Mechanical troubles limited production but these difficulties are now being overcome. The operation of these plants will be of some assistance in dealing with the anticipated surplus during the coming season.

The manufacture of sterilized milk at the Model Dairy, Bulawayo, was suspended during the latter part of the period under review due to extensive buildings alterations. Production should commence in the near future with improved manufacturing facilities.

Dairy Bonus Scheme. Approximately £10,000 was paid out to producers under this Scheme for the season ended 30th September, 1956. Of this amount just under £5,000 was paid to the suppliers of milk to the Gazaland Co-operative Cheese Factory, Chipinga. In view of the poor season experienced in the Chipinga area, payments for the season under review will be less. Preliminary figures indicate that they will be approximately £4,600. The total cost of the scheme is anticipated to be approximately £12,600.

Milk Recording. The volume of work has continued to increase and it has become increasingly difficult to maintain existing services. It has not been possible to bring about any appreciable improvement in disposing of the backlog of annual statistical returns. The appointment of additional staff to cope with the increasing amount of head office work is an urgent necessity.

The Scheme has now been extended to Northern Rhodesia, and one milk recorder has taken up duties in this area. Developments in the initial stages will be on a very limited scale and confined to the Mazabuka and Lusaka districts.

The post of Dairy Officer to take charge of the Milk Recording Scheme has recently been filled, and consideration is being given to the establishment of a Bureau of Milk Records. Fees for milk recording were charged from 1st August, 1957, the minimum charge per visit being increased to £2. For this amount 20 tests are carried out free of charge, but all additional tests are charged for at the rate of 6d. per test. The additional fees have not resulted in many withdrawals from the Scheme.

The results of the Annual Milking Competitions for the last few years and the combined official and semi-official Herd Averages are given in Tables IX and X.

TABLE IX.

PRODUCTION OF WINNING HERDS IN MILKING COMPETITION.

Year	*Milk Section*	*Butterfat Section*
1948/49	12,933 lb.	443·3 lb.
1949/50	13,509 lb.	460·7 lb.
1950/51	14,400 lb.	459·6 lb.
1951/52	15,207 lb.	493·2 lb.
1952/53	13,548 lb.	486·0 lb.
1953/54	12,917 lb.	440·8 lb.
1954/55	13,772 lb.	496·6 lb.

TABLE X.

HERD AVERAGES — PEDIGREE AND GRADE HERDS.

Year	Completed lactations	Average Milk production per cow	Average Butterfat production per cow	Percentage Butterfat	Days
1947/48	4,699	5,897	216·6	3·73	278
1948/49	5,173	5,891	217·6	3·70	277
1949/50	5,184	5,776	212·1	3·67	276
1950/51	5,381	5,840	215·0	3·68	271
1951/52	5,436	6,412	244·1	3·81	279
1952/53	5,554	6,265	228·3	3·64	274
1953/54	5,798	6,583	236·1	3·59	279
1954/55	7,330	6,415	246·9	3·85	280

GENERAL

The Dairy Industry continues to expand, the main development being towards the disposal of whole milk from farms. The surplus to whole milk requirement continues to increase and is more than adequate to meet cheese requirements. The sale of skim milk to natives and the manufacture of skim milk powder will assist in disposing of the increasing surplus. Butterfat supplies to creameries have increased mainly due to the separation of surplus milk and whey by the Dairy Marketing Board.

Extensive alterations have been made to the Dairy Marketing Board Dairy at Bulawayo with the object of improving conditions for milk intake and manufacture. The main task now confronting the Board is the erection of a new dairy at Salisbury on the site that has already been acquired. The planning of the new Salisbury Dairy is receiving active consideration.

Activities of the Dairy Branch. The services provided by the Branch include the inspection of factories and farms, grading of dairy produce, sampling and testing of milk, advisory work on the production of milk and manufactured products, lecturing at Gwebi Agricultural College and various other activities such as judging of dairy produce at Agricultural Shows and attending meetings.

The volume of work has continued to increase and it is becoming increasingly difficult to maintain existing services. Every effort has been made to recruit suitably qualified men for the Dairy Officer vacancies but no success has been achieved. The recent transfer of one Dairy Officer from Southern Rhodesia to Northern Rhodesia has increased the seriousness of the position. It is evident that unless additional staff are appointed to deal with the technical and administrative work of the Branch it will become exceedingly difficult to maintain existing services.

4. POULTRY

G. H. COOPER

CHIEF POULTRY OFFICER

The 1956 season proved to be one in which production of poultry products increased considerably. As has occurred in the past, the increase appears to have been too rapid for the market to absorb at 1956 prices and therefore prices of eggs in particular and hens have dropped during 1957. The season, therefore, with an increase also in feed costs, has been less profitable to poultry producers than for the last three years but has not assumed a serious setback, though it is expected some marginal producers will give up or curtail production.

Marketing and Organization. Whilst the National Poultry Council of the Rhodesia National Farmers' Union is still in existence it did not have occasion to meet during the year, there being no problems of importance submitted for consideration. The Federal Marketing Council has not yet reported on the proposals for egg grading on a voluntary basis submitted last year. Grading of retail eggs, however, has increased considerably in Salisbury and sales of cartoned, graded eggs now form an estimated 70 per cent. of total retail sales. The sale of graded eggs has not, however, progressed in other centres, due to lack of private enterprise to undertake wholesaling.

The stocks of egg pulp manufactured in 1956 by the Rhodesian Malt Products, Ltd., have not been fully consumed in 1957, some 1,800 tins (40 lb. each) remaining in store. This was due to the much shorter high price season this year, enabling bakers to take up fresh shell eggs more freely. No pulp has been stored in 1957, but some shell eggs have been stored by bakers in Bulawayo.

A significant trend in the marketing during the flush season this year has been the large quantity of eggs purchased by Africans in the urban areas. Considerable business is done in hard boiled eggs in African townships, particularly since the sale of European beer has been permitted. Apparently this beer does not give the satisfaction derived from native beer and therefore more buns and eggs are required. It would appear that there is a very extensive market available for eggs amongst urban Africans at prices which are remunerative for spring production, viz. 2/6d. to 3/- per dozen. This development is to be encouraged as it not only provides an outlet for

seasonal surpluses but is a valuable source of the highest quality protein food for Africans which all nutritionists have emphasized is lacking in their diet. Eggs are more easily transported and marketed than milk, and when cooked (as is the general method of sale) will keep satisfactorily much longer than milk. Urban Africans have largely overcome the prejudices against the eating of eggs, found amongst some tribes.

Eggs have been supplied regularly to the Copperbelt from Southern Rhodesia and thus no import of eggs from outside the Federation has been required.

The marketing of table poultry has seen very little change during the year and is still mostly in the hands of individual producers, who sell through retailers. The Rhodesia Refrigerating Co. Ltd., operating a processing works in Bulawayo has had difficulties with supplies, but has improved its standards and is providing some of the requirements of the Copperbelt, which has to import considerable quantities from South Africa.

A move to form a Table Poultry Producers' Co-op. in Salisbury is being considered and if a strong organization could be established it is felt that the necessity for importations would soon be overcome and a more stable market developed within the Federation for local producers.

The Cold Storage Commission, Salisbury Branch, has installed improved plant to handle poultry for butchers and it is expected that this will lead to an improved quality of product.

The sales of day-old chicks by breeders fell off somewhat at the end of this season due to the low prices for poultry products being received. Generally the season has been good but definitely down on 1956 in respect of sales. The quality of stock supplied is variable and in some cases not satisfactory. In spite of the efforts of this Branch it is more difficult to influence the quality of stock produced from a commercial hatchery than it was a few years ago when nearly every individual producer did his own breeding. The result is that in many cases the quality of commercial stock on farms is not as good today as it was in pre-war years.

The importation of day-old chicks into Northern Rhodesia has been placed on a quota basis with a view to encouraging local breeders to produce the country's requirements. Importations were restricted to 50,000 during 1957, but a considerable leakage occurred in allowing "special" chicks in, which in many cases could not have been special at all. An allowance is made for stock unobtainable in the Federation, and the Marketing Officer stationed in Lusaka who issues permits has been supplied with full details of breeders and will now be in a position to control requests for "special" import permits, in collaboration with this Branch.

Egg Prices. The seasonal fluctuation in prices followed the usual curve but owing to increased supplies in the "off" season were lower during the peak period March to June than in 1956 and only reached the same retail price of 6/- per dozen for standard size for about six weeks. The flush season—mid July to October—also provided larger supplies and lower prices than in 1956. In consequence retail prices in Salisbury have declined by about 6d. per standard dozen from 1956 to 3/9d. to 3/10d. per dozen, which is a 12 per cent. drop. Much the same prices prevailed throughout the Federation except on the Copperbelt, where, owing to lack of local production, retailers kept prices steady at a high figure of 5/- per dozen. There is some seasonal surplus of eggs in Northern Rhodesia this season and prices are likely to drop there in future.

Requests for grading of eggs have been received and although this is carried out on a voluntary basis to some extent, compulsory grade sales would benefit both consumer and producer.

Table Poultry. The production of quality young table birds continued to expand and prices remained at the same figures as in 1956, viz. 3/6d. to 3/9d. per lb. dressed, selling at 4/6d. per pound retail. Live weight prices have been steady at 2/3d. to 2/6d. per lb. for this class of bird, but have dropped slightly for culls from 1/9d. to 1/3d. per lb. Prices for turkeys have remained at 2/9d. to 3/- per lb. live weight.

Some large producers are now operating and producing quality birds at the rate of two to three thousand per week throughout the year, but the majority are produced by mixed farmers with an output of 50 to 200 per week and it is for these producers that a selling organization is required to stabilize production.

Prices for cull hens have been affected by the increased production of better quality birds, which is to be expected; however, if the egg producer must write down the value of his culls considerably it increases the costs of egg production and therefore a processing plant to handle this type of bird is also becoming necessary.

In some areas African production must also be considered, but generally the increase in this production has not been marked, though it certainly has some influence on the prices paid for European culls.

Grading of table poultry has also been requested by the Bulawayo and District Poultry Association and must receive attention in the near future.

Imports. These consist almost entirely of day-old chicks and dressed table poultry from the Union of South Africa and are confined to Northern Rhodesia. Both commodities are still under import control and only bare requirements are allowed entry. It is hoped the full Federal requirements will be met by 1958. Imports of day-old chicks amounted to 134,331, an increase

on last year, and table poultry to 370,139 lb. a slight reduction on last year. A few imports shown for eggs from South Africa are in fact from Bechuanaland. Some importation of chickens from the United Kingdom and Denmark took place for breeding purposes.

Exports. The principal export is the day-old chicks from Southern Rhodesia to neighbouring territories and this trade is developing annually.

The following tables give details of the imports and exports of poultry products for the Federation from August 1956 to July 1957 inclusive.

IMPORTS OF POULTRY PRODUCTS.

Article and Country of Origin	Quantity	Value
Poultry, live: No.		£
United Kingdom	3,063	590
Union of South Africa	130,068	11,482
Denmark	1,200	325
Total	134,331	12,397
Poultry, dressed: lb.		
Union of South Africa	361,816	46,880
United Kingdom	4,366	1,079
Bechuanaland	3,908	200
Iceland	45	11
Tanganyika	4	1
Total	370,139	48,171
Eggs in Shell: Doz.		
Union of South Africa	6,372	1,159
United Kingdom	109	96
Tanganyika	87	16
Total	6,568	1,271
Eggs, liquid or dried: lb.		
Netherlands	55	9
United States	12	4
Total	67	13

EXPORTS OF POULTRY PRODUCTS.

Article and Country of Destination	Domestic Produce		Re-exports	
	Quantity	Value £	Quantity	Value £
Poultry, live: No.				
Mocambique	12,030	1,197	—	—
Kenya	7,092	1,104	800	65
Belgian Congo	6,295	2,342	—	—
Union of South Africa	1,000	90	—	—
Bechuanaland	162	18	—	—
Uganda	100	22	—	—
Tanganyika	738	130	—	—
Total	27,417	4,903	800	65
Poultry, dressed: lb.				
Belgian Congo	8,307	1,425	—	—
Mocambique	232	46	—	—
Bechuanaland	18	4	—	—
Total	8,557	1,475	—	—
Eggs in Shell: Doz.				
Mocambique	12,005	4,447	—	—
Tanganyika	2	1	—	—
Total	12,007	4,448	—	—
Eggs, liquid or dried lb.	—	—	—	—

Numbers of Poultry, Poultry Products Sold, and Value in 1956. The numbers of poultry in Southern Rhodesia showed a substantial increase in 1956. The main increase was in fowls. The numbers of poultry as at 30th September, 1956, with the 1955 numbers in brackets, were as follows:—Fowls 644,994 (527,878); Ducks 26,563 (23,905); Geese 3,371 (2,766); Turkeys 24,045 (17,630). Total 698,973 (572,079).

The number of hens' eggs sold was 2,147,525 dozen, valued at £367,999, a large increase over 1955 when 1,818,193 dozen were sold, valued at £283,632.

Table birds sold amounted to 802,140 lb. valued at £112,929, again a very substantial increase over 1955 when 583,458 lb. were sold for £81,864. This indicates the development of the "broiler" trade which has been very marked during the last three years.

For the first time some figures for Northern Rhodesia are available, as follows:—

Numbers of Poultry. Fowls 240,471; Ducks 6,994; Geese 536; Turkeys 5,212. Total 253,213.

Poultry Products Sold. Eggs 1,108,000 dozen valued at £185,430. Table birds 181,000 lb. valued at £33,266.

Day-old chicks sold numbered 790,033 valued at £65,313, which shows a considerable increase over 1955, when the comparable figures were 560,444 and £48,475.

Figures for sales of other live poultry are not available as yet.

The following table gives by groups the number of producers rendering returns, and the total number of poultry kept:—

Group	*Number of Producers*	*Number of Fowls*
Under 100	2,480	95,308
100 — 249	498	73,116
250 — 499	200	67,378
500 — 999	120	85,363
Over 1,000	140	323,829
Totals . . .	3,438	644,994

The figures quoted are actually a good deal lower than the real numbers. Small holdings of less than 25 acres are outside the scope of the agricultural census and consequently some very large poultry farmers are not included. This is a matter of some concern and it is felt that the poultry census should be more accurately compiled to give due weight to its importance compared with other livestock returns.

Poultry Feeds. There has been no significant change in the stock feeds position except that a quantity of damaged maize was disposed of to manufacturers and farmers. Much of this was perfectly sound and was bought at cheap rates; this, however, had no effect on prices charged for stock feeds, which rose slightly during the year.

A committee to consider standards for stock feeds was set up by the Rhodesia National Farmers' Union and met twice during the year. It is considering recommendations to adopt standards in conjunction with the South African Bureau of Standards or the newly-formed Rhodesian Standards Association. A sub-committee is at present collecting information. Stock feed manufacturers generally are keeping up to date in respect of their products and special feeds of high quality for various classes of poultry are readily available.

The registration of stock feeds for poultry has been carefully checked by this branch and advice given to manufacturers in an endeavour to raise standards as high as possible. Manufacturers have in all cases been co-operative and open to suggested improvements.

GWEBI COLLEGE

Poultry Branch

The Thirty-Seventh Annual Official Egg Laying Test concluded on January 31st, 1957. A full report on the Test was published in the March-April, 1957, issue of the *Rhodesia Agricultural Journal.* Results were an improvement on last year. The Cash Score (or commercial test) has proved successful and results in this section have been published for the Thirty-Eighth Test which commenced on March 1st, 1957. Arrangements are in hand to run this section as a separate test in batteries for any commercial class of stock from 1958.

Building Construction. A new three-unit laying house to accommodate 300 layers was completed and equipped during the year in time to house the 1957 Leghorn flock. It is a new design of house for demonstration purposes as well. An additional brooder house, which will take up to one thousand chickens to four weeks of age, was also completed and used this season. It has not been entirely satisfactory for mid-winter use and some minor modifications will be carried out before next season. New camps for turkeys were also completed.

Educational. A programme of 30 lectures on poultry husbandry was given to first-year students and practical instruction at the College continued throughout the year to all students.

A successful short course in poultry was held from September 16th to 20th inclusive and was attended by 24 farmers. Lectures and demonstrations were given by the Lecturer in Poultry, the Poultry Officer, Matopos, the Chief Poultry Officer and a Veterinary Officer.

Stock. The stock on hand was as follows:—655 adult stock, including pedigree breeders and pullets under test; 2,507 young stock under six months, all pedigreed; 112 turkeys; 163 ducks of all ages, and 15 geese.

Utility breeds kept are White Leghorn, Black Australorp, Rhode Island Red, New Hampshire, and a few specimens for demonstration purposes of White Australorp, North Holland Blue, Indian Game, Brown Leghorn, and White Silkies. Pekin, Khaki Campbell, and Rouen ducks, and Chinese geese are also kept.

Four White Leghorn pedigree cockerels from a breeder in the United Kingdom were imported and used for breeding this season.

Birds were entered on the Young Bird Show and Salisbury Agricultural Show, and received several awards.

Revenue. Sales of eggs and table poultry to hostel staff and the Salisbury Hospital amounted to 13,680 dozen and 7,038 lb. respectively, which together with Egg Laying Test fees and the sale of pedigree cockerels by auction gave a total revenue of £2,784.

Trials. The long term progeny testing work continued, but otherwise no investigational work was carried out.

MATOPOS RESEARCH STATION

Poultry Section

Stock on this Station remained at approximately 1,200 birds, which is about the limit of the present adult accommodation.

During the year a block of six new breeding pens was commenced but is not fully completed to date.

Trials. Feed trials were carried out with mash donated by milling companies in respect of table bird production, but these firms do not wish results containing their feed formulae to be published. Trials using chemical hormone treatment were carried out with variable results and require more work before any definite conclusions can be drawn.

A long term feeding trial with high level antibiotic feeding of growing stock in respect of its effect on growth rate, livability, and eventual hatchability of the birds receiving the antibiotic, was started. Results to date indicate no benefit from the use of the antibiotic used but again it will be necessary to repeat this work before any conclusions can be expected.

HENDERSON RESEARCH STATION

Fisheries Section

Duck breeding, for the stocking of ponds and dams for weed control trials, was continued. Rouen ducks appear to be more useful in this respect but Pekins are also satisfactory.

It has not been possible to run any additional feeding trials, though poultry is being kept for compost production.

EXTENSION AND ADVISORY SERVICES

The services of the Poultry Branch for specialist advisory purposes continued to be in great demand and were fully met, having regard to the funds available. Numerous visits were paid to private farms in all areas, and several farmers' meetings, Young Farmers' Club and Poultry Club meetings were attended.

An officer of the Conservation and Extension Department received specialist instruction and local experience prior to taking up a position as Extension Officer for small-holdings on the Copperbelt.

The Poultry Officer, Matopos, spent a week on farm advisory work in Northern Rhodesia in the Livingstone, Mazabuka and Lusaka areas.

DISEASE

The Federation continues to be singularly free from serious poultry diseases, none having occurred during the year. There have been the usual isolated cases of Cholera, Typhoid, and Bacillary White Diarrhoea. The testing of all breeding stock for Typhoid and B.W.D. from which stock will be sold, carried out by the Veterinary Department, has continued to keep these diseases completely under control.

Coccidiosis, though prevalent, does not appear to have caused the chicken mortality that it has in other years. The Leucosis complex is still one of the most serious diseases, and causes considerable losses in some flocks. The breeding and selection of resistant strains is the most satisfactory way of combating the scourge.

Very effective control of internal and external parasites is achieved by the use of modern drugs and insecticides combined with good hygiene.

Strict control of importations of poultry and hatching eggs continues to be the policy of the Southern Rhodesia Veterinary Department with the full support of this Branch.

The Veterinary Laboratory, Salisbury, supplies chicken pox vaccine and provides valuable diagnostic and postmortem examination services for poultrymen in Southern Rhodesia.

SHOWS AND CLUBS

All Agricultural Shows exhibiting poultry in the Federation were attended and judges provided, from this Branch, for the various Societies and Clubs. Entries were excellent everywhere and some of the newer district shows staged good exhibits. The Poultry Officer, Matopos, who judged at Livingstone and Lusaka, commented unfavourably on the quality of stock exhibited and it would appear that farmers in those areas require more experience and knowledge of breed standards.

A Poultry Section was featured in the Gwebi College exhibit in the departmental hall at the Salisbury Show.

Club activity has centred round the Shows, though the Bulawayo Club has combined with the R.N.F.U. Poultry Committee in Bulawayo in forwarding resolutions on poultry matters to the National Poultry Committee.

5. PASTURE RESEARCH

DR. O. WEST

CHIEF PASTURE RESEARCH OFFICER

Dr. O. West, appointed Chief Pasture Research Officer with effect from 1st January, 1956, continued in charge of the Grasslands Research Station until the end of November, 1956. He was transferred to Salisbury on 1st December, 1956.

Early in 1957, the Chief Pasture Research Officer was seconded to the Food and Agriculture Organization of the United Nations to undertake a survey of the pasture potential of the Federation of Malaya, and was abroad from 21st January to 31st March. He attended conferences on *Agricultural Botany* and on *Herbicides* at the Muguga headquarters of E.A.A.F.R.O. in Kenya on his way to F.A.O. in Rome and en route to Malaya spent a week in Ceylon with officials of the Department of Agriculture and the staff of the Coconut Research Institute.

At the end of his assignment he spent ten days' vacational leave in the United Kingdom where he visited the Grassland Research Institute at Hurley and the departments of agriculture at Oxford and Cambridge.

Pasture Research Conference. The first conference of pasture research specialists working in Southern Rhodesia was held at the Grasslands Research Station on the 3rd, 4th and 5th of June, 1957. The first two days of this Conference were devoted to discussion and review of the pasture research work in progress at Grasslands, Matopos and Henderson Research Stations, the third day to a more general discussion of the re-organization and policy of pasture research in Southern Rhodesia. The results achieved were very gratifying and have already given rise to constructive re-organization and streamlining of the station programmes.

The Conference stressed the need for a fresh and more vigorous approach to the following important problems:—

1. The finding of effective arboricides for bush clearing and for the control of encroachment.
2. The need for producing effective strains of *Rhizobium* for legume inoculation and for the testing and certification of commercial strains of *Rhizobium* exposed for sale.
3. The need for a properly organized Herbage Plant Introduction and Testing Service.
4. The need for the commencement of a comprehensive vegetation survey with permanent staff and facilities.
5. The need for a thorough investigation of the problems involved in running sheep intensively on established pastures.

PLANT INTRODUCTION

The most important development during the year was the introduction, successful for the first time, of a number of clover species together with their specific strains of *Rhizobium* from Kenya. Previous attempts to introduce East African clovers have failed because the very specific strains of *Rhizobium* peculiar to these clovers were not introduced. Indigenous African clover species have also been introduced from Basutoland and from Angola.

A pigeon pea (dahl) variety from the Humpata Plateau in Angola is showing promise of being reasonably frost resistant. Other pigeon pea varieties, selected for possible resistance to frost, have been obtained from India. A very vigorous strain of Nile Grass collected on the Cunene flood plain in Angola is most promising and is being bulked for field trials.

A selection of *Panicum maximum* from plants originally collected in the Sabi Valley and used for the first time in large scale grazing trials at Grasslands this year, is exceptionally promising under a wide variety of conditions. Preliminary reports from Kutsaga indicate too that its resistance to eelworm is high. Foundation seed of this new strain has been made available to the Rhodesia Pasture Seed Growers Association under the name of "Sabi Panicum".

Several other interesting grass and legume species are undergoing preliminary observation and trial in nursery beds.

PASTURE SEED PRODUCTION

The growing importance of this young industry is illustrated by the sales of registered grass seed produced by members of the Rhodesia Pasture Seed Growers Association over the first four years of its existence.

1954	5,309 lb.
1955	15,600 lb.
1956	29,660 lb.
1957	36,000 lb. (estimated)

At 4 lb. per acre, which our information indicates is a fair average of the seeding rates used, these figures represent an increasing acreage seeded to Rhodesian grown, registered, dryland pasture grasses each year.

1954	Estimated acreage seeded	1,427 acres.
1955	Estimated acreage seeded	3,902 acres.
1956	Estimated acreage seeded	7,415 acres.
1957	Estimated acreage seeded	9,000 acres.

(The acreage actually seeded to pasture in each year has of course been considerably greater, as the figures given do not include unregistered, Rhodesian grown seed or seed imported from the Union of South Africa.)

The relative importance of the different species and the overall trends in seed production are well illustrated by analysis of the registered seed produced and sold for the years 1954, 1955 and 1956.

Type of Seed	Season '54		Season '55		Season '56	
	Sales	Price per lb.	Sales	Price per lb.	Sales	Price per lb.
Katambora Rhodes	2,600	25s. 0d.	10,355	12s. 6d.	23,100	10s. 6d.
Giant Rhodes	1,580	15s. 0d.	3,496	12s. 6d.	3,880	10s. 6d.
Bambatse Panicum	1,016	30s. 0d.	1,514½	12s. 6d.	1,770	10s. 6d.
Setaria Kazangula	114	15s. 0d.	152	10s. 0d.	175	15s. 0d.
Weeping Lovegrass	nil	—	92½	25s. 0d.	735	12s. 6d.
Total	5,310 lb.		15,610 lb.		29,660 lb.	

This rapid increase in production, which has been accompanied by a very great improvement in quality both as to germination and purity, gives cause for satisfaction and redounds to the credit of the Rhodesia Pasture Seed Growers Association.

It must be remembered, however, that our growing seed industry is still totally unable to meet the local demand and for this reason the country has to import a large quantity of seed each year.

There is an urgent need to increase the production of locally grown seed at least to the point where the local demand can be satisfied so that the country can be spared the expense of importing large quantities of seed less suited to our requirements than the locally selected and registered strains.

There is a danger, too, that the prices at present being obtained for Rhodesian grown, registered seed will lead to increasing competition from outside. Commercial strains of Rhodes and other grasses can be imported at prices very much lower than the selling price of our registered strains in Southern Rhodesia. It is known that some of our strains are being grown for seed in the Union and elsewhere and it is possible that in the near future externally grown seed of strains in demand here, will be available in quantity.

This should be an incentive for improving the efficiency of seed production in the Federation. It is considered that the most useful approach to the economic production of grass seed is to regard the seed as a by-product from grass pastures established primarily as pastures and not for seed production only.

RESEARCH STATIONS

Reports on the pasture investigations and ecological studies in progress at Grasslands, Matopos and Henderson Research Stations are included in the reports of those Stations.

The report of the Melsetter Pasture Station follows, as this Station now falls directly under the Chief Pasture Research Officer.

MELSETTER PASTURE STATION

Staff. Mr. F. R. Williams, who had been in charge of the station since its inception, resigned with effect from 31st October, 1956, to take up a commercial appointment. Mr. D. H. M. Clark recently appointed officer-in-charge of Melsetter, took over from Mr. K. Humphrey on 15th January, 1957.

Weather. Rainfall for the season 1956-57 was 33.87 inches, well below the average for the station, with serious droughts in the spring and through the growing season, followed by an almost dry winter.

Temperatures recorded at the Chisengu Forest Station show the absolute maximum screen temperature to have been 85.4° F. on 15th February, 1957 (a maximum of 84.7° F. was recorded on 28th October, 1956). The absolute minimum screen temperature was 40.8° F. on 18th July, 1957. February was the hottest month with an average maximum of 75.4° F. and the coldest month was June with an average minimum temperature of 47.5° F.

Station Development and Buildings. Four semi-detached cottages were built for African labourers. A re-orientation of the fencing of grazing paddocks has been commenced. Numerous partition fences have been removed for easier management of the dairy herd.

Livestock — Dairy Herd. It has been decided to reduce the dairy herd to 20 cows in milk. Fifteen cows and heifers were transferred to the Henderson Research Station in May.

Range Cattle. With the exception of six young oxen which are being trained, the herd of scrub cattle originally taken over with the station is being disposed of. Fourteen old cows were sold in May and the remainder will be sold during the coming season.

Sheep. The flock of 12 merino ewes and a German merino ram acquired by the station two years ago, have now increased to 32 ewes and one ram. During May, 11 of the wethers were slaughtered and the carcases examined by the District Veterinary Officer. The incidence of internal parasites was particularly low and only small numbers of wire worm were found. The dressing percentage of the wethers was 54 per cent.

The average birth weight and weaning weights of the lambs for the year were as follows:—

Born	*Number*	*Birth weight*	*Weight at 3 months*
October '56 . . .	12	12·5 lb.	57·0 lb.
April '57	4	14·0 lb.	59·5 lb.

Investigations — Summer Pastures. The policy of using the dairy herd to measure the production of the pastures was continued but, because of the poor season accentuated by an almost complete drought in February and a very dry winter, serious difficulty was experienced in maintaining the herd on the acreage of summer pasture available for grazing.

The situation was saved by the seven acres of Napier Fodder grown in 3 ft. rows, which provided approximately 70 tons of silage in a cut taken at the end of February as well as providing extremely valuable grazing in May and June (145 cow-grazing days per acre), and again in October. In this season the great value of Napier Fodder in frost-free, dry winter areas has been demonstrated in a very striking manner.

Because of the shortage of productive grazing it was necessary in early June to begin feeding dairy meal at the rate of 4 lb. per gallon of milk produced. This will be continued until the summer pastures are productive.

Irrigated Pastures. Because of the dry year it was necessary to commence irrigation as early as February. The rate of application through the existing spray system was measured by 24 rain gauges distributed at random for two hour periods. A series of measurements showed that the rate of application was approximately 0.44 inches per two hour period. In order to avoid obvious signs of drought it was found necessary to apply approximately ¾ in. every five days in September and October. This is the maximum rate of application possible with the existing equipment, and is obviously not sufficient for optimum growth.

Prior to May the pasture was grazed intermittently using the whole herd which alternated between dryland summer pastures and the irrigated pastures. When, however, the summer pastures could no longer provide sufficient grazing for the dairy herd, eight of the highest producers were grazed full time on the irrigated pastures (approximately seven acres) while the rest of the herd were fed silage. Later, in September, the number of grazing cows had to be reduced to six due to the lack of water and resultant poor growth of herbage.

Pasture Renovation. Two blocks of Kikuyu pasture originally established in 1950 as pure stands without clover, were topdressed with two tons of lime and 300 lb. of superphosphate, rotovated and overseeded with white clover in December. A good germination of clover seed was obtained.

New Pastures. Two acres of Kikuyu and 3½ acres of Grasslands Kazungula Setaria were successfully established on new land. Six acres of land previously cropped with potatoes were re-established to *Paspalum dilatatum.*

Potato Trials. Three potato trials, fertilizer, date of planting and a varietal trial, were carried out for the Chief Agriculturist and Chief Plant Pathologist. These will be reported on by the Potato Breeder.

Veld Management Studies. Practically all the veld grazing in the Melsetter area consists either of north facing slopes covered by *Brachystegia* woodland and tall grass (*Hyparrhenia, Themeda, Cymbopogen* spp., *Loudetia*, etc.) or highland grass in which the most important species are *Tristachya hispida, Elyonurus argenteus, Alloteropsis semilata, Eragrostia capensis* and *E. brizoides, Harpechloa falx, Digitaria monodactyla,* etc., and in some aspects *Loudetia simplex.*

Neither of these extensive vegetation types are represented on the station where the vegetation is a dense macchia seral to forest with forest relics in the "kloofs". Thus it has not been possible to initiate any work in the management of veld grazing but the effect of various burning, mowing and grazing treatments on the composition of the *Smithia-Psoralea* macchia is being studied in two trials which have been down since 1949.

Future Work. Up to the present the main objective on this station has been the development of productive pastures from unproductive *Smithia* and *Psoralea* scrub. Very satisfactory progress has been made in this direction and a stage in the development of the station has been reached when more detailed and scientific investigations of particular problems and aspects are required and will, it is hoped, be begun.

Lines along which it is intended to proceed in the immediate future include:—

(i) Detailed assessment of the productivity and carrying capacity of different pastures during the different seasons of the year and at different levels of fertility.

(ii) Detailed studies of the forage sequence requirements of different classes of stock.

(iii) The nutritional requirements of various *Trifolium* species and allied leguminous genera. Work will be commenced with Trifolium pratense, T. repens, T. semipilosum and T. roupellianum.

(iv) Studies in the establishment of pasture species, e.g. Paspalum dilatatum. Considerable difficulty is experienced at present in obtaining good stands of this species, which has proved to be one of the more promising summer pasture grasses for the area.

(v) Topdressing and overseeding trials on natural veld with the object of improving areas which cannot easily be ploughed.

(vi) The introduction and trial of promising legumes for the improvement of low quality silage at present made from Napier Fodder.

(vii) The use of other grasses and grass legume mixtures for silage making.

6. GWEBI AGRICULTURAL COLLEGE

DR. W. L. FIELDING

PRINCIPAL

EDUCATION

The Diploma Course. Course No. 7 passed out of the College in July, 1957. Experience gained in the years since the College opened has been consolidated, so that the final assessment of a student's major subject marks in both First and Second Years, includes a proportion of marks from tests, half-year examinations, practical work and competitions, as well as final examinations. In addition, the majors are weighted in proportion to the time devoted to any particular subject, and this determines the order of merit. The system is thorough and fair and such that the time has now arrived to award First Class as well as Standard Diplomas. Course 7 results include eight First Class Diplomas, carrying ten Distinctions, and 19 Standard Diplomas, carrying one Distinction.

In the College report for the year ending 30th September, 1955, it was stated that an expansion programme would provide residential accommodation for 70 students, and it was said that the question of adequacy of staff establishment and training facilities for the larger numbers remained to be tested. The size of a lecture class is limited only by seating capacity of the lecture hall and facilities for clear hearing, and Gwebi has proved adequate in this connection. Matters are very different at practical work, however, because of the individual, personal nature of instruction. There must be adequate facilities (machines, tools, animals, acres) and instructional staff. If the First Year Course exceeds 36 in number then difficulties are encountered, students may not receive adequate training, and a heavy strain is imposed on the present staff establishment. The provision of further facilities, such as tobacco production and additional instructors would rectify the position. The provision of these additional facilities is approved in principle by higher authority but cannot be achieved at present, due to financial stringency.

It is important, therefore, to keep First Year numbers to a satisfactory level, meanwhile. As in the Union Colleges courses vary in character, quality and application to work. Some students leave of their own accord, during the first year, for various reasons, or it may be suggested that

they leave because their non-application to work is disturbing to the rest of the class. Others may leave through illness, and a proportion of those sitting the final First Year examinations may fail. These losses vary from year to year, and if the First Year intake is maintained at 36, the complement of students in residence will naturally vary. The ideal, from many points of view, is, of course, approximately equal numbers in the First and Second Year classes, of the two-year Diploma Course, and in some years this will be more nearly achieved than in others.

With the larger numbers of students and consequently increased numbers of examination papers to mark, students now go down immediately after writing the examinations. In the past they have remained at College until the results were available, but it proved difficult to keep them occupied during this period and they became restless, showing limited interest in visits to farms and places of agricultural interest which were arranged for them. Diploma Day, when diplomas and awards are presented, was now planned with a two-fold purpose in view; firstly to present the diplomas, and secondly to provide opportunity for visitors to see the College Farm in the growing season, instead of in mid-winter as in the past.

Diploma Day was held on 19th December, 1956, when the Governor of Southern Rhodesia and Lady William Powlett were the Guests of Honour and students of Course No. 6 returned to receive their diplomas. The second object was not satisfactorily achieved as a downpour of rain discouraged all but the most ardent of the visitors from viewing the farm.

It was decided that the next Diploma Day would be held as near to the beginning of a College Year (first week in October) as possible. The second objective would now be to let students in residence see students of a previous Course receive their awards, with the hope that the ceremony, conducted early in their First and Second years, would imbue them with a spirit of endeavour. The College farm would, of course, still be open to view, but in late winter or early spring, and not in the growing season.

Short Courses. The importance and possibilities of providing Short Courses for practising farmers have been further explored. The following courses were held:—

26th-30th August, 1957: Welding.

2nd-6th September, 1957: Farm Machinery.

16th-20th September, 1957: Poultry.

It was intended to have a maximum of ten students in the Welding Course, because of the necessity for individual instruction; owing to pressure of applicants 12 were finally accepted, and it proved possible to give adequate instruction to this number, particularly as additional equipment was loaned by firms. The course in Farm Machinery was organized and conducted by the Senior Lecturer in Engineering and the Farm Machinery Engineer of the Department of Conservation and Extension, whilst numerous firms and practising farmers took part in the demonstrations, talks and discussions. A wide field was covered and the course was successful except that the number of students (fluctuating between 16 and 28 on various days) was disappointingly small. Publicity was wide, but possibly an earlier, general announcement, even if the programme is not finalized, may draw larger numbers.

The Poultry Short Course was successful as usual; a preponderance of women students attended. Consideration will now be given to holding courses of shorter duration, on special aspects of poultry husbandry, rather than continuing with the general type of course so far held.

General. The Principal was appointed Chairman of a Special Committee which investigated the establishment of a College of Agriculture for Africans on the general lines of Gwebi. During the course of these investigations the Principal visited African farming areas and existing centres of African agricultural education in various parts of the Federation.

The interest of Gwebi students in African agriculture was encouraged by a visit to the headquarters of the Department of Native Agriculture, Domboshawa School, and a Native Reserve.

The Second Year student tour took place in Matabeleland, whilst outdoor teaching over a wide range of farms and Research Stations in Mashonaland continued.

The Senior Lecturer in Field Husbandry attended a course in Farm Planning.

DEVELOPMENT

A major administrative development was the creation of three Senior Lecturers' posts, these officers serving under the Principal, in charge of the three major sections:—

(i) *Field and Laboratory Section.*

Lectures in Basic Sciences, Crops, Pastures, Conservation, Farm Management, Field Operations and Research, Laboratory Analyses.

(ii) *Animal Husbandry (including Poultry) Section.*

Lectures, Practical Instruction and Research in Animal Husbandry, including Veterinary Science and Poultry.

(iii) *Engineering and Building Section.*

Lectures, Practical Instruction and Research in Agricultural Engineering, Building Construction and Survey.

The hostel, estate and administrative office staff are directly responsible to the Principal. The post of Vice-Principal has fallen away, the College being generally administered by the Principal and the three Heads of Sections, who act, in rotation, for the Principal when absent.

The Conservation and Extension Officer of the Gwebi-Hunyani I.C.A. now has his living quarters and office at the College.

Development in the Sections has been as follows:—

Field Husbandry. The old bull pens, vacated owing to infection of the area with footrot, were usefully converted to stores for pasture work requirements. Improved pastures have been established in several areas of the College farm, the grasses used including *Paspalum dilitatum, Giant Rhodes, Katambora Rhodes, Panicum Bambatsi, Panicum Makarikari, Kikuyu, Napier, Creeping False Paspalum* and *Tanner.* These are in varying acreages and systems of management and will, in due course, enable the College to produce its own grass seed supplies in adequate quantities. The College has assumed responsibility for the Gwebi-Hunyani I.C.A. Grass Plots which will provide excellent facilities for instruction of students on sandveld.

Development of natural veld paddocks continued.

The new "range system" has been adopted for agronomy experiments, and material purchased for the construction of a vermin- and thief-proof fence and field fertilizer and seed store.

The two rotations in Broadbalk field have been modified in the light of previous experience, the changes including the ploughing-in of maize stover where maize is followed by legume hay and green manure, and the introduction of limited continuous maize. Morgan and Rifle Range fields, on the south side of the College farm, have been added to the Veterinary Department Field Station.

A plane table survey has been made of the area intended for tobacco culture, and controlled stumping is in progress. Dangerous gum trees in the farmyard are being felled.

The Prison labour gang has now left Gwebi, being replaced by casual and contract labour.

Noteworthy development is the Herbarium and Geological Museum in the Lecture Hall, whilst the Laboratory has acquired some excellent new biological specimens and continues to carry out valuable analytical work.

Animal Husbandry. The dairy was re-equipped with a new sterilizer, surface cooler and immersion cooler, resulting in greater efficiency in the production of whole milk. New bull yards and cattle stalls were constructed, the building serving as a practical building exercise for students. Camp 6 near the main entrance was fenced, and is now in use by the Hereford herd. A junior stud sire was purchased for the Friesland herd. Other additions were two Persian lambs, a Large White and a Landrace boar, together with a Landrace gilt. The most notable development at the poultry plant was the construction of a 360-bird Californian-type laying house, with trapnesting accommodation and slatted sun parlour. A new brooder house was completed in time for the hatching season. Geese were acquired from Henderson Research Station.

Engineering and Building. The experimental workshop was completed and equipped, and a dynamometer constructed for engine testing. Windmills were replaced at two paddock boreholes with engines, the work providing useful practical instruction for students. Plan drawing was introduced to the building syllabus. The programme of equipment demonstrations by Salisbury firms was expanded.

THE COLLEGE FARM

Rainfall, 33.55 inches, was slightly above the 40-year mean of 31.96 inches, and was well distributed.

Field production included:—

Crops	*Acres*	*Production*	*Yield/Acre*
Maize (Broadbalk Field)	82·25	2,012·00 bags.	24·46 bags.
Maize (Gwebi South)	163·10	2,225·75 bags.	13·64 bags.
Sunflower (seed)	18·00	79·00 bags.	4·38 bags.
Groundnuts (unshelled)	3·50	74·00 bags.	21·14 bags.
Natal Sugar Beans	9·00	38·00 bags.	4·20 bags.
Soya Beans (seed)	4·30	10·00 bags.	2·32 bags.

Winter Feeds	*Acres*	*Production*	*Yield/Acre*
Maize Silage	69·50	646·00 tons.	9·29 tons.
Legume Hay (Soya bean)	44·40	54·00 tons.	1·21 tons.
Legume Hay (Cowpea)	19·00	16·75 tons.	0·88 tons.
Legume Hay (Dolichos bean)	11·00	21·00 tons.	1·90 tons.
Legume Hay (Velvet bean)	11·00	17·50 tons.	1·60 tons.
Veld Hay	214·00	118·00 tons.	0·55 tons.

From the following table it can be seen that a steady rise in mean maize yields has taken place over the past few seasons:—

	Gwebi South.	*Broadbalk.*
1954–55	11·15 bags/acre.	14·23 bags/acre.
1955–56	11·96 bags/acre.	22·35 bags/acre.
1956–57	13·64 bags/acre.	24·46 bags/acre.

One strip in Broadbalk produced a new record, with 29.25 bags/acre, whilst another strip produced the high yield of 17.5 tons/acre maize-legume silage.

For the first time in the history of the College there was no maize breeding programme, the work having been transferred to the new Breeding Station.

Despite a setback, due to a period of temporary sterility in the stud sire, the dairy herd continues the satisfactory level of production reported last year. Herd averages for the year under review were:—

	Lactations	Heifers	lb. Milk	lb. Bf.	% Bf.	Days
(*a*) Pedigree Frieslands .	14	5	8,603	337	3·93	295
(*b*) Grade Frieslands . .	22	6	10,971	400	3·65	298

Whilst overall B.F. was up, total milk production was 175 lb. down on average due to double the number of heifers being recorded and the fact that several good, old pedigree cows were retained in the hope that they would produce a few more heifer calves before their useful life ends.

Grade Friesland Cow No. 79 established two new College records with the lactation levels of 14,485 lb. milk and 524 lb. B.F.

A breakdown of sales of produce and livestock reveals the following:—

Milk		25,572 gals.
Steers and breeding stock		112
Calves		13
Sheep		34
Pigs—	baconers	78
	porkers	44
	weaners	14
	sows	10
	breeding stock	45

The College cattle again did well at the Royal Show, outstanding being the Hereford cow, Oxo's Marina of Mayfield, again adjudged Champion Hereford and Reserve Champion Beef Cow. The College also won several poultry prizes, whilst the College section of the Federal Ministry's Stand drew a large number of visitors.

Poultry produced 13,680 dozen eggs, and 7,038 lb. of table poultry, whilst 30 cockerels were sold. Stock on hand at the end of the year was:—

Egg-laying test	187
Adult stock	655
Chickens hatched (under 6 months)	2,507
Turkeys (all ages)	112
Waterfowl (all ages)	163

RESEARCH

Time for research at Gwebi remains limited, although some useful work has continued with crops and pastures, with animals and in engineering. As stated in previous reports, there can be little general development of research in engineering and animal husbandry without the provision of additional staff. Due to financial stringency there seems little hope of this at the moment.

Pastures. The fertilizer-grazing trial in top-land veld has now completed its first cycle, all paddocks having been fertilized three times. The trial will be continued for another four-year period and it is hoped to establish an area of improved pasture adjacent to the trial to provide another comparison.

The year under review produced the best liveweight gains per day and the shortest grazing period yet experienced in the trial.

Run-Off Plots. Improvements, including additional tanks, are being effected. Second year maize showed a loss of 2.72 tons/acre compared with grass (in its third year) 0.77 tons/acre.

Federal Maize Trial. Populations of 12,100, 14,520 and 16,900 did not produce significantly different yields. 250 lb./acre ammonium sulphate increased yield by 6.67 bags/acre, a further 250 lb./acre produced an additional 3.75 bags/acre. No interactions were evident and superphosphate showed no significant differences between the levels applied.

Nitrogen with Maize. Two trials compared types and levels of nitrogenous fertilizers applied at different times. One experiment showed no response to nitrogen, whilst the other demonstrated that there was no gain in applying both basal and top-dressing, and the most satisfactory application appeared to be a top-dressing of 300 lb./acre ammonium sulphate.

Phosphate Placement with Maize. This year the differences between treatments (Nil; 200 lb./acre superphosphate broadcast and ploughed in, broadcast and disced in, or banded in the row), were not significant. Indications from previous years are that ploughing-in phosphate is the best method.

Variety Trials. Ten maize varieties were compared at the request of the Salisbury Experiment Station. Of particular interest are the scores for maize blight (*Helminthosporium turcicum*) which are given together with grain yields:—

Variety or Hybrid	*Yield Bags/Acre*	*Blight Rating*
56 H 4	20·62	0·85
51 H 37	17·01	2·42
50 H 35	16·36	2·78
55 3/W H 86	16·14	2·48
52 D H 60	15·62	2·41
52 D H 32	15·26	2·67
52 D H 30	13·36	2·78
Hickory King	12·68	1·92
Southern Cross	11·83	1·62
Salisbury White	8·07	2·06
Least significant difference (5%)	3·23	0·27

The progress in breeding of blight-resistant maize is indicated by the outstanding performance of 56 H 4. It is interesting that the trial was late planted.

Residual Fertilizer Effects. During 1954-55 and 1955-56 maize following Napier grass was very heavily fertilized with ammonium sulphate. In 1956-57 no ammonium sulphate was applied but dressings of lime equal to the total weight of ammonium sulphate applied in the last two years were applied to one half of each plot. A considerable residual effect of ammonium sulphate was demonstrated and liming proved generally beneficial.

Wheat. Work on this crop was continued in liaison with the Government Wheat Breeder, but the results are unfortunately of little value, due to differential lodging, caused by a heavy rainstorm and wind.

Potatoes. Some Dutch material showed considerable promise as shown by figures in the following table, and there is a close though not absolute relationship between blight infection and yield.

YIELDS OF POTATO TUBERS IN BAGS (150 LB.) AND LATE BLIGHT RATING.

Variety	*Yield*	*Blight Rating 49 Days after Planting*	*Blight Rating 84 Days after Planting*
Furore	153·89	1·0	25·0 to 50·0
Gineke	148·52	1·0	50·0
Pimpernel	146·28	1·0	5·0
Voram	136·55	1·0	25·0
Prof. Broekma	119·66	5·0	95·0
Tedria	53·75	25·0	75·0 to 95·0
Kennebec	19·67	25·0	95·0 to 100·0
Pentland Ace	8·62	75·0	100·0
Up to Date	2·91	75·0	95·0 to 100·0

Cotton. The fertilizer trial was abandoned due to a poor stand and failure of the bolls to open. Once again the College provided facilities for Messrs. Plant Protection and Fisons Pest Control to conduct experiments.

Inter-Breed Feeding Trial. The College has now commenced its third trial of this kind, buying 6-8 months old beef breed steers and using various methods of feeding. This work started when the late Mr. Willoughby gave six Mashona steers to the College. Treasury authority now exists for the purchase of 24 steers every two years, and their feeding on foods purchased or home-produced with funds from revenue votes. When sold the proceeds accrue to the College Recreational Fund, for the construction of fixed assets (swimming bath, squash court, sports pavilion, etc.), which become the property of Government. The general aim of the trials is to produce information, over a period of time, concerning the advantages and disadvantages of various systems of feeding of exotic and indigenous beef breeds. For reasons of finance and facilities, the number of cattle in each trial is restricted and variation within groups will tend to preclude validity of weight comparisons in any particular year. Following discussion with the Biometrician, however, it is satisfactory to report that the use of bulked data, for each breed, over a period of years, would be likely to produce valid data. It is hoped to obtain authority to purchase 30 (instead of 24) steers in each two-year period, so that the breeds represented would remain: Hereford, Sussex, Mashona, Golden Dunn (Tuli) and Afrikander.

Sheep. Studies are in progress with a view to increasing lambing percentage with Blackhead Persians, and are already producing successful results.

Internal Parasites. Studies of different treatments were made in conjunction with the Veterinary Department, but unfortunately the animals used were so free of parasites that no conclusions could be drawn.

Engineering and Building Construction. Very little research was possible owing to limitations of staff, though the Lecturer in Engineering served on a Committee investigating the development of research and testing of engines and equipment. Progress cannot be expected until funds become available.

Pilot investigations on outdoor and barn hay-drying continued. Various types of flooring are being observed in the new bull-yards.

7. HENDERSON RESEARCH STATION

Dr. J. W. ROWLAND

OFFICER-IN-CHARGE

The Henderson Research Station lies in the centre of the maize growing area of Mashonaland, and serves some ten million acres of land, on which three quarters of the maize, more than half the tobacco, and roughly two-thirds of the miscellaneous crops of Southern Rhodesia are grown. It supports one-quarter of the dairy cows and one-fifth of the total European owned cattle also.

With an annual rainfall average of 35 inches and extensive areas of rich loam soils, the region is described by Staples and Murray in their bulletin on "Farming Systems" as being "rarely subject to severe dry spells during the rainy season, and therefore suitable for intensive systems of mixed farming". The research which is in progress in crops, pastures, and livestock, on both dry and irrigated land is bearing out this view.

European Staff. Throughout the year the European staff has been up to strength, save for the short periods when replacements were effected. All residential accommodation was occupied.

DEVELOPMENT

Building and Construction. Work commenced on the new Laboratory and Office Block, a Bachelors' Mess was completed, and a number of cottages were built for African staff. Six miles of fencing was erected. Two small storage dams were constructed on the Irrigation Section, and some 60 acres of land were prepared for irrigation experiments.

On account of the construction of the new main road from Salisbury to Mazoe over four miles of station land, considerable work had to be carried out on the re-alignment of farm roads and fences to adjust to the altered route.

Crops and Pastures. The Station maize requirements were produced on 150 acres, and 80 acres were successfully established to Rhodes Grass.

Maintenance and Machinery. The continued presence of the C.M.E.D. mechanic on the Station has proved invaluable to the maintenance of tractors and equipment.

African Staff. The African staff are content; the native school continues to be of great benefit; the Station's clinic serves a very good purpose on the Station, and a great many cases of minor ailments are dealt with. The African Beer Hall has been in operation and this, run on a limited profit basis, has provided many facilities, otherwise denied to the African staff, such as uniforms for the school children, footballs for the soccer team, and other charitable donations.

FARMING OBJECTIVES

Difficulties have long been experienced with the development of improved pastures on farms, and over the past six years an experimental intensive farm unit producing milk and maize has been evolved on 300 acres of difficult contact loam soil. The maize is grown on 70 acres of arable land in a ten year rotation comprising maize, ley pastures and legumes in a ratio of 4:4:2. The grazing land comprises 70 acres of sown Rhodes and planted Napier pastures, and 150 acres of natural veld and vlei. Ten acres of irrigated pastures provide green feed in winter.

It has been found that this farm can be operated by one European and 14 African workers. 50 Jersey cows and their followers are now producing upwards of 70 gallons of milk daily, and the annual maize crop is 600 bags. With the natural increase of the cattle, this points to a potential gross annual production of £4,800 for milk and young stock, and £1,200 for maize.

To attain this level of production, a capital investment in fixed improvements such as farm-house, dairy, fencing, pastures, water, etc., of £15 per acre is necessary over and above the cost of the land. Movable assets in the form of livestock, equipment, machinery, etc., amount to £20 per acre. Annual running costs including depreciation and interest, fertilizers, feeds, labour, repairs and fuels are in the region of £4,000.

It is clear now that the use of leys for maintaining soil fertility in the more difficult maize soils need not reduce the maize crop (600 bags annually from 28 acres under maize on this Unit), and with the aid of permanent improved pastures the leys and crops can support large numbers of productive livestock. Indeed, with a judicious development of pastures and an appropriate livestock regime, the animals immediately dominate the agricultural picture. In the case of this experimental Unit, the value of livestock products is four times that of the maize crop of 600 bags from the 70 acres of arable land.

The ten million acre area served by the Henderson Station comprises some 2¼ million acres of African territory, and of the remainder some 560,000 acres have been or are under the plough or used as follows:—

90,000 acres tobacco;

200,000 acres of maize;

70,000 acres of other cash crops;
100,000 acres of green crops; and
100,000 acres of land lie fallow.

If pastures were to be incorporated in this scheme of things, 200,000 acres could be established on the area now lying fallow and under green crops, and an additional 130,000 head of productive cattle could be maintained without any encroachment on crops grown for sale.

In this instance, fresh milk has been the form of livestock production under scrutiny, and the system has been developed by trial and modification to a stage where the pastures, crops and cows are paying economic returns, without any sidelines. Attention is now being turned to the development of pigs, sheep and beef cattle as subsidiaries within this main framework. The potentialities of the dairy herd are far from fully developed.

It is perhaps worthy of mention that to produce ten million gallons of milk and 240,000 bags of maize along these lines, 120,000 acres of land might be committed, comprising no more than 40,000 acres of improved pastures and 17,000 acres of maize and other crops.

Present prices limit the market for fresh milk to the European and a small number of well-to-do urban Africans. The great majority of the African population is unable to afford milk, and with animal protein production in Southern Rhodesia only amounting to 43 per cent. of the population's minimum needs, malnutrition is widespread.

It is a matter of extreme urgency therefore that ways and means be explored whereby this capacity of pasture to produce large amounts of milk and meat can be developed and made use of at this stage. Attention is being concentrated on finding ways and means of lowering the costs of production, and most encouraging results are now emerging from current experiments with dairy and beef cattle within the framework of maize and pasture rotations. Following New Zealand methods, preliminary work is showing that for six months of the year improved pastures and vleis can produce substantial quantities of milk at very low cost from grazing alone. In addition to this, the work on beef production is showing that proper winter nutrition appropriate to various classes of livestock—cows, weaners and young steers—can be achieved at low cost by the use of the low quality fibrous feeds which are available in immense quantities through the area every winter, supplemented by low priced additives such as urea, minerals and vitamins.

In the past year, high quality slaughter cattle have been produced at under two years of age on summer grazing and the above dry winter feeds. It has been the lack of knowledge of pasture use and of the real deficiencies in the animal's diet in winter that has checked the widespread use of improved pastures. These obstacles have now been removed and the practical application of the above findings is being developed and costed on farm-scale experiments.

The work points to a future of greater yields and lowered costs of production. To meet the dire need for milk and meat for the Africans there appears to be justification for differentiating between the European demand for milk at existing price levels, and the African need for milk and meat products at a much lower price—in such forms as sterilized fat-free milk products, flavoured milk, separated milk powders, and low priced meat products.

Top experimental yields of maize have varied between 30 and 40 bags per acre for the third year in succession, and the promise shown in earlier years of soil stabilization, fertility improvement and sustained high yields at reduced costs is being fulfilled in respect of pasture use, trash farming with high fertilizers, and high populations of maize.

The problems of processing, preservation and distribution need special attention and it is hoped that work will soon be started on this phase, in respect of crops and livestock products. Yields of 1 to 1½ tons of legume grain, with a digestibility protein content of 20 per cent. and more, are being consistently obtained from both Jack bean and improved varieties of Soya. Ground-nuts are yielding well also. These crops promise to disperse the problems of protein supplementation, which have for so long restricted the development of economic livestock husbandry in these areas.

The production of fish from ponds and dams has passed out of the conjectural stage and it is now known that 3,000 lb. of fresh fish as well as about 400 ducks can be produced annually at low cost from ponds of one acre in size, without any difficulty.

Detailed notes on the progress of sections follow:—

RESEARCH ON PASTURES

The research and developmental programme were conducted with a labour force of 14 Africans and a European staff of one technical assistant and one senior professional officer. All requests for advisory visits and talks were met and the work of the section was explained to a large number of visitors to the Station. The Senior Pasture Research Officer visited Australia and New Zealand, as the official Federal delegate to the Seventh International Grassland Congress.

Forage Sequence Studies. Initial investigations have provided basic data for the establishment of varying planes of nutrition from pastures. These planes, obtained through the use of different grass types together with specific forms of management, provide forage sequences into which

the several classes of livestock can be placed and enable any desired pattern of production to be achieved.

Summer Grazing Pastures. Results indicate that a high degree of efficiency of utilization can be attained when fertilized grass pastures are grazed through the growth period. Where 40 lb. nitrogen and 38 lb. phosphoric oxide fertilizers are applied per acre annually, a productive grazing season of 120 days is obtainable with a carrying capacity of one 800 lb. steer per acre.

Such pasture can induce a liveweight increment of 220 lb. When an additional 40 lb. of nitrogen per acre is applied, the grazing season is extended to 180 days and the liveweight increment raised to above 300 lb. In addition to this, one to two tons of herbage are available for conversion into silage during the flush season.

The production was not affected by rotational grazing, set-stocking or electric fence management of the pastures, and similar results were obtained from all the five grass species used. It would appear, however, that the stoloniferous types are more adapted than the tussock types to this form of management.

Silage and Aftermath Pastures. The use of pastures for silage purposes would appear to be justifiable only in special circumstances, since good winter feeds can be produced at a low price from more easily available sources.

Giant Rhodes grass, Kazungula, Setaria and Star grass grown in mono-specific pastures and fertilized with 80 lb. of nitrogen and 38 lb. phosphoric oxide yielded 7.5 tons of fresh herbage for silage, per acre. In addition, these pastures provided 84 grazing days per acre of aftermath grazing in autumn. When stocked at the rate of two steers per acre this grazing resulted in a liveweight increment of 42 lb. per head.

The yields of herbage for silage were not appreciably affected by either feeding the animals on the pasture during the proceeding winter, nor by feeding in pens and returning the manure mechanically, nor by failing to return the manure from the previous silage crop.

A satisfactory plane of nutrition for over-wintering beef steers to gain ¾ lb. per head daily was achieved by feeding grass silage together with dry matter in the form of stover and a protein supplement of Jack bean meal.

Foggage Grazing Pastures. Results have indicated that foggage grazing pastures provide a cheap substitute for silage in providing beef breeding cows with a roughage ration during the winter.

Gold Coast Napier fodder, Giant Rhodes grass and Katambora Rhodes grass grown in mono-specific pastures and fertilized with 20 lb. nitrogen, provided 60 grazing days per acre. The results from all species were similar and, during the period June to mid-September, the liveweight of the beef cows was maintained.

Vlei Grazing. Vlei grazing provides valuable spring grazing for beef breeding cows and enables calving to take place some six weeks before the rains. Using a stocking rate of one cow to three acres, an average liveweight gain of 30 lb. per head was recorded in a 105 day period extending from August to November.

Veld Grazing. The quality of the veld grazing is not of a high order and under proper management can only be expected to supply producing classes of stock with a relatively short grazing season. Employing a three herd and four camp with burning management system, at an overall stocking rate of one steer to four acres, an average liveweight increment of 119 lb. per head was recorded for a 126 days grazing period extending from December to March. The total increment was attained during the initial ten weeks and only maintenance was obtained for the latter portion of the grazing season.

Beef breeding cows, grazed under conditions identical to those above, gained 75 lb. in liveweight in a 175 day grazing period extending from December to May.

Irrigated Pastures. Results indicate that pastures of Kikuyu-clover and *Paspalum dilatatum*-clover have a greater carrying capacity and produce higher liveweight gains in beef steers than either Fescue-clover or Lucerne pastures during the warmer months of the year. During a grazing period of 196 days from August until February, liveweight increases were 912 lb., 930 lb. 654 lb. and 687 lb. per acre for the Kikuyu, Paspalum, Fescue and Lucerne pastures respectively. These pastures all produce only small amounts of herbage during the dry months June to September inclusive, and annual pastures have to be used at this time if green herbage is needed in quantity. The search for winter green and productive irrigated perennial pastures continues.

Legumes. Vigna parviflora is a promising legume for use in first year pastures when these are seeded in the early part of the season. *Teramnus uncinatus* and *Desmodium discolor* provide a valuable protein supplement when used in foggage pastures. *Canavalia ensiformis* (Jack bean) is a heavy yielding annual which fits into the general farming operations and is of value in providing beef steers with their protein requirements.

Seasonal Milk Production. The establishment of a productive six months grazing season from improved pastures has provided a basis on which to investigate the production of seasonal milk. A start has been made using this grazing season for the majority of the lactations and extending production into the dry months through the use of high yielding annual forage crops.

The efficiency of the operations peculiar to this type of dairying is being studied, in addition to the feed sequence necessary.

This study of seasonal milk production aims to reduce the price of summer milk greatly. The cows calve down on vleis and fertilized pastures in early spring, and are dried off in early winter. They are carried over to September on the cheap roughages which are proving so valuable for dry cows and growing cattle.

The productive capacity of pastures on such a system is in the region of one to two cows per acre throughout summer and during the 180 days of their growth period they can be expected to produce some 300 gallons per cow grazing. Concentrate supplements for the year can be provided for each cow from ¼ acre of Jack bean and ¼ acre of maize.

Similar simple and productive forage sequences are coming forward for beef cattle.

RESEARCH IN ANIMALS

General. The staff consists of one Senior Animal Husbandry Officer, assisted by a Senior Stockman.

In co-operation with the Department of Conservation and Extension, the Senior Animal Husbandry Officer has carried out a considerable number of farm advisory visits, addresses to farmers' meetings and farmers' days, and has participated in lecturing at two beef cattle courses.

Progress has been made during the past year in the investigation of nutritional factors limiting beef production, and in the development of suitable beef production systems for the high rainfall red soil areas.

Digestibility Studies. The evaluation of feeds and grazing pastures, by digestion trials and tracer techniques has continued on a limited scale. The greatest single factor limiting the rapid development of this work has been inadequate facilities for the chemical analyses of samples.

Fertility of Beef Breeding Herds. A long term investigation to determine the nutritional factors responsible for the low fertility of beef breeding herds under ranching conditions has been initiated. A considerable amount of developmental work was necessary before this research project could be started. The experimental area comprises some 800 acres of veld, vlei and steep hill grazing. This has been fenced, a borehole drilled and equipped, and the normal dipping, weighing, and handling facilities created.

Eighty 3½-year-old crossbred Hereford heifers have been obtained from Matopos Research Station for this work. These were bred during February and March, and nutritional treatments were imposed from 1st May, 1957.

Considerable differences in body weight between groups have already been recorded. These results indicate that the principal nutrient deficiencies in winter veld grazing are protein, minerals and vitamin A.

According to a recent pregnancy examination, over 90 per cent. of the experimental animals are in calf. There are no differences between the conception rates of the various nutritional groups. This is only to be expected, however, since treatments were imposed after the breeding season.

Low Quality Roughages. Investigations into the utilization of low quality roughages and non-protein nitrogen by beef cattle have received priority this year. The results to date indicate that low quality roughages such as maize crop residues, foggage grazing and winter veld grazing can be very efficiently utilized by beef cattle and are capable of high rates of production if correctly supplemented.

A wide variety of supplement combinations has been tested. For adequate growth of young stock these supplements must provide from ½ to ¾ lb. digestible protein daily to correct the almost complete lack of protein in the roughages. It has been found that at these levels of production non-protein nitrogen can effectively replace approximately 50 per cent. of the required protein supplement. Adequate mineral and vitamin A supplementation is also necessary for efficient utilization of the basic roughages.

This type of feeding appears to hold considerable promise for the production of low cost beef with a high biological efficiency. Experiments have shown that it is possible to market 2-2½ year old steers weighing 1,000 lb. during the winter months at a very much lower cost than has previously been possible with the use of conventional feeds and feeding techniques.

General Development. The health, fertility and production of the breeding herds of Afrikander and Aberdeen Angus cattle has been satisfactory during the past year. The introduction of adequate handling and dipping facilities (using spraying and modern dips) has almost completely eliminated the incidence of tickborne diseases.

During the year two young Afrikander bulls were purchased, one locally and one imported from the Union of South Africa.

RESEARCH IN FIELD CROPS AND IRRIGATION

The work has been carried out by the Senior Agronomist, an Agriculturist and a Technical Assistant, together with 25 African employees.

Irrigation — Construction Work. Forty acres of land have been prepared and laid out with furrows, pumps and storage dams for various forms of irrigation, including several methods of overhead spraying, and surface applications in beds, furrows, basins, etc. A further 50 acres have been supplied with storage dam, and a pump. This will be ready for irrigation experiments in the coming winter. Flow records in the river show that at least in one year in 11 there will be no water available for irrigation, since the entire flow will be needed for fisheries research which has a prior claim. The need to construct a dam to store floodwater higher up the catchment of the Dassura or Gutu rivers is great, since a dry year can bring the irrigation programme to a halt. Preliminary surveys have been made by the Irrigation Department, and several suitable sites have been located.

Potatoes. A number of experiments have been carried out to provide information on varieties and techniques in conjunction with the Potato Breeder, and the Branch of Botany and Plant Pathology. Certain quick maturing varieties have produced high yields and there was little evidence of blight on the winter irrigated crop. The early crops suffered from frost damage, and time of planting and mulching trials may be of value in investigating this problem.

Lucerne. A collection of 23 varieties was established in May and September, and certain varieties, e.g., Commercial S.A., Caliverde, African and Hairy Peruvian showed promise. A commercial planting has been established and is progressing well.

Wheat, Barley and Oats. Eight varieties of wheat from various parts of the world were examined for yield, rust resistance and susceptibility to lodging. A rate of seeding/Nitrogen trial with wheat, barley and oats was also carried out. The results of these trials are not yet available.

Vegetables. Numerous small scale variety, fertilizer, and mulching trials have been conducted on vegetable crops, as a preliminary to more comprehensive work, particularly on vegetable seed production. Vegetable seed production can be most remunerative and it may well be a very important crop under Highveld irrigation.

Dryland Crops. Research has been continued and developed in the growing of crops other than tobacco.

Maize Rotation Experiment. In order to investigate alternative methods of maintaining soil fertility in maize production under continuous cultivation, three rotations are in progress:

(a) Legume hay, maize (with five tons dung), maize.

(b) Maize continuously with high fertilizer nitrogen.

(c) Maize (stover removed), green manure.

The mean yields of four plots, in bags per acre, for the past three seasons were:—

Rotation	Plant Population	1954–55	1955–56		1956–57	
1. (a) 1st Maize Crop	9,680 14,520	27·1 —	24·8 28·1	(3·3)	28·8 35·0	(6·2) *
1. (b) 2nd Maize Crop	9,680 14,520	28·6 —	24·6 27·8	(3·2)	29·0 33·1	(4·1)
2. Maize continuous	9,680 14,520	30·0 —	24·4 28·9	(4·5)	27·1 32·9	(5·8)
3. Maize/Green manure	9,680 14,520	27·5 —	23·7 25·0	(1·3)	28·9 31·5	(2·6)

* (Stover yields in tons per acre. Each year all plots received a basic dressing of phosphate and potash.)

The above figures reflect seasonal differences, but it is seen that high yields of maize are being obtained from all treatments and the effect on yield, of high population, is most marked.

Maize Population/Fertilizer Trials. In one trial the maize showed marked responses to nitrogen, especially at the lower levels. The experiment showed a reduced response to N. at the highest plant population levels. While it is not possible to interpret this effect at this stage, it was observed that during the heavy rains that occurred late in December, the high population plots showed nitrogen starvation. It is possible that more timely use of nitrogen could have corrected this on the high population plots which it may be expected will be more dependent on fertilizer nitrogen than lower population plots. No responses to phosphate or potash, were obtained.

The Federal Population/Fertilizer Trial has completed its first year. A linar response to nitrogen, interaction between nitrogen and spacing, and a possible response to potash are the main points that emerge from the results of this trial.

Maize Variety Trials. In a trial of ten maize varieties, hybrids outyielded open pollinated varieties. Two hybrids (51H37 and 56H4) averaged 37.5 bags per acre whereas Southern Cross, Hickory King and Salisbury White gave 27.7, 26.0 and 16.2 bags per acre, respectively.

Maize Weed Control. In a pre-emergence trial the following main points emerged: MCPA caused malformation of growth especially at 2 lb. acid equivalent per acre. Optimum results were obtained from plots weeded once, twice and four times respectively, without weedkiller application.

Results from a post-emergence weedkiller trial on maize, indicated that not more than 1 lb. acid equivalent per acre of MCPA (potassium salt), 2, 4-D (amine salt) and 2, 4-D (ester) effected good weed control and was fairly safe when applied to maize plants not taller than 12 to 15 inches high.

Silage Crops. Various mixtures, with maize in 7ft. rows, were tried out. The advantage of a mixed planting for silage is that the silage ingredients are already mixed in suitable proportions in the field. Yields of from 20 to 28 tons per acre silage material were obtained from mixtures of maize with velvet beans, jack beans, soya beans, munga and mixtures of sunnhemp, sunflower and munga. From 40 acres of maize and maize-grain crop mixture, 300 tons of good silage was made this past season.

Soya Beans. Of 17 varieties of soya bean from Potchefstroom, all are earlier than the Salisbury varieties, No. 147 and 237, but produce much less bulk and, except for one variety, gave substantially less seed.

The Variety/Date of Planting Trial was repeated and seed yields were of the order of two bags/acre lower than last season's crop. The effect of late planting (3rd January) in reducing seed production is well marked.

Ground-nuts. The production potential of Virginia Bunch and Spanish Bunch was much the same and optimum yields were obtained from planting up to the middle of December, later plantings resulting in reduced yields. Greater yields were obtained from a spacing of 3″ in the row (21″ between rows) than from 6″, 9″ and 12″ in the row.

Velvet Beans. Velvet beans suffered "vine rot" on Land 2 while a healthy crop was produced on Land 12. Several varieties of cowpeas suffered from fungus leaf and stem diseases.

Successful green manure crops were obtained from three rows of dhal and one row of sunflowers and from sunnhemp, sunflowers and munga (3:1:½) broadcast at 40 lb. seed per acre.

Commercial plantings of ground-nuts produced 38-42 bags of unshelled nuts (65 lb.) per acre; Soya beans at 6-7 bags per acre: Sugar beans planted 13th December grew rapidly and produced a good crop of beans in two months but suffered from rust and other leaf, stem and pod diseases.

Castor Bean. Ten varieties produced good early vegetative growth, but were all later attacked by *Alternaria* leaf blight and "blossom drop". Four varieties produced no seed at all and the rest produced an average of 120 lb. clean seed per acre.

Cotton. A District Variety Trial and a Small Bulks Trial were carried out for the Gatooma Research Station and will be reported by them. A commercial planting of approximately one acre produced a yield of 700 lb. seed cotton per acre which was not as good as had been expected. Poor yields and a high percentage staining were due mainly to late planting, overcast and rainy weather following planting and a heavy insect attack late in the season.

EROSION CONTROL RESEARCH

(This work is carried out by the Department of Conservation and Extension in collaboration with the Department of Research and Specialist Services.)

The work described above consists of the assessment of the production potentialities from the land in the form of crops, pastures and livestock. Production from the land and the removal of farm produce tends to draw on the fertility reserves of the soil, and hitherto, in the sub-tropics, serious soil depletion all too often goes hand in hand with the conversion of virgin grass and woodland into farms. In order to have a firm knowledge of the basic causes and processes involved in soil deterioration, under farming practices, experiments have been devised by the Department of Conservation and Extension to show how much water and soil is lost from various crops, from land under different forms of cultivation and from pastures on different soils on commonly found slopes.

The areas of land involved in these critical experiments are as follows:—

Contact soil: Series I Experiments	6 acres
Red Soil including the Lysimetry Block: Series II Experiments	7 acres
Granite Sand Soil in two areas: Series III Experiments	11 acres
Tatagura Soils	12 acres
TOTAL	36 acres

The progress made in the past year is reported on by the Director of Conservation and Extension.

VISITORS

Ten meetings have been held of the Henderson Research Station Agricultural Scientific Society, and an average attendance of 85 has been achieved.

In the past year more than 1,500 visitors, individuals and in groups and on farmers' days have inspected the work of the Station.

FISHERIES

Aims. In Southern Rhodesia the only body competent to deal with questions on fisheries is the Fisheries Research Centre on Henderson Research Station. This institution, therefore, has to deal with all aspects of fisheries, and fish exploitation, throughout the country. The aims for the Centre are consequently as follows:—

1. The physical, chemical and biological (limnological) investigation of natural water, dams and ponds.
2. The establishment and development of fish culture with reference to the following aspects:—
   (a) The development of pond systems and layouts with a view to the most suitable exploitation of water and land resources.
   (b) The investigation of suitable indigenous or exotic fish for pond and dam culture. This entails a study of the natural history of these fish and the development of selected pedigree stock.
   (c) The investigation of stocking rates for different types of ponds and dams. This means the establishment of suitable rates and composition of fish species and size for different conditions of water, feeding, etc.
   (d) The investigation of the feeding value of foodstuffs for fish production.
   (e) The investigation of the use of fertilizer—kinds and application—in the raising of fish yields.
   (f) The establishment of standard management methods for obtaining the best results in dams and ponds.
   (g) The integration of fish culture into agricultural practice.
   (h) The efficient utilization of fish by-products.
3. The carrying out of surveys to facilitate realization of all fish resources, both potential and actual, and the encouragement of their optimal exploitation.
4. The study of, and development of means of control of fish diseases, pests and predators.
5. The investigation of the sanitary control of waters by means of fish culture.
6. The development of the sporting fish resources of the suitable waters.
7. The development of suitable fishing gear and equipment for fisheries exploitation.
8. Investigation and development of the technology of processed and fresh fish.
9. The development of efficient marketing methods of fish and fish products.
10. Participation in the framing of suitable public fisheries regulations.
11. Extension and fisheries education:—
   (a) Breeding and distribution of stocking fish.
   (b) Training of farmers and other interested persons, in fish culture and fisheries.
   (c) Holding of fisheries courses for extension and conservation officers.
   (d) Publicity on fisheries matters of general interest by the holding of meetings, fisheries days and through the press.
   (e) Instruction and advisory work.
12. The conservation of all fresh-water fish resources and the control of river pollution by effluents, etc.

Organization. With the completion of all experimental ponds it has been possible to embark on a fuller research programme than heretofor. However, this entails considerably more time and energy and, as outside work has also increased tremendously, the pressure of work is greater than ever before. In the interests of fisheries development in this country it is essential to find a solution to the problem of adequately dealing with all the tasks that are awaiting attention. In the previous report it was stated that first priority was being given to research; however, it is impossible to maintain this attitude in the face of current developments and research work is suffering. From the financial point of view, as a Section of Henderson Research Station, the Fisheries Research Centre obviously cannot expect more money than any other section on the Station; yet to carry out the very great task of developing fisheries in this country, increased financial support is necessary.

Fisheries Research Centre. The above style has been adopted in preference to "Experimental Fish Farm", in conformity with the fact that rather than a farming practice being followed, a wide diversity of research, both basic and applied, is carried out. Also work is not restricted to this site, as a result it has become a centre for fisheries investigations and developments spreading throughout the country.

The fry production section remains unbuilt. Technical work at the Centre has been the consolidation and improvement of roads, canalization, drainage systems and general facilities. More attention can now be given to improving the site from an aesthetic point of view, such as planting lawns, trees, etc. It has become a matter of urgency to fence the pond area due to the high predatory pressure as some of the experiments are being seriously affected.

Research. Research has proceeded according to the plan approved by the Research Advisory Committee. The results to date have given valuable leads to be followed in subsequent investigations. A simple method has been worked out whereby farmers, having no knowledge of fish culture, are able to attain productions of 3,000 lb./acre per year in ponds. This is by the utilization of ducks and pigs as fertilizer and feeding agents. The same system with cattle may prove satisfactory, but this remains to be investigated. Higher production can be achieved by the application of specialized knowledge and more complex techniques. The figure of 3,000 lb./acre per year is extremely satisfactory, when compared with a maximum production of 500 lb./acre in Middle Europe in the best ponds, and by specialists, using complex techniques, including appreciable expenditure on fertilizers and feeds.

Preliminary indications of the optimum stocking rate to be adopted under different conditions of nutrition have been obtained, and further research should elucidate this question satisfactorily.

Experiments have indicated the maximum population which can be carried by ponds and dams under different levels of nutrition. These agreed with previous observations obtained by fishing. Growth of fish under different conditions has been studied and figures for the proportion of fish of different species for mixed stocking have given indications for further work. Some interesting results on the dependence of different species on different types of foodstuffs have also been obtained. An experiment in the Savory Dam to investigate the effect of angling has been under way since February, 1957, and results so far indicate that satisfactory fish management by angling alone is not possible. Experiments in fish culture in dams in different areas is continuing. Limnological and biological observations on nearby dams are continuing and giving interesting results.

General. The First Annual Fisheries Day was held in August, 1957. This was attended by Government officials, agricultural educationalists, fisheries workers and commercial firms interested in fisheries development. The aim of the Day was to bring together those connected with fisheries development in this country, who had not previously met on a common ground. The meeting was a great success and a valuable aid to fisheries development. Twenty-one papers, of which ten were contributed by the Staff of the Centre, were presented at the specialized discussions. These papers will be published as a symposium in the Rhodesia Agricultural Journal.

The Fisheries Library is still in a very poor state. No books have been received on this year's allocation, although four from the previous year were received. A few journals are received through the generosity of colleagues in other countries, but more of the usual biological journals important in fish culture should be available.

There is a great need for the employment of more educated African personnel on the staff, but unfortunately this was not possible with the finances available.

Exhibits were staged at the Beatrice, Salisbury and Bulawayo Shows. Further attention has been given to problems in connection with fish development of Lake Kariba.

ACKNOWLEDGEMENTS

The Station is indebted to Messrs. African Explosives and Chemical Industries (Rhodesia) Limited, Messrs. Windmill Fertilizers (Rhodesia) Pvt. Ltd., Messrs. Fisons (Rhodesia) Ltd., for each having donated £243 worth of fertilizer for research purposes.

8. GRASSLANDS RESEARCH STATION

H. D. L. CORBY

OFFICER-IN-CHARGE

The Grasslands Research Station, at Marandellas, serves the agriculture of some 12½ million acres of sandy country in north-eastern Southern Rhodesia, where rainfall is usually sufficient, and sufficiently reliable, for arable farming without irrigation. In other words, it serves the main tobacco-growing districts.

Within its means, the Station deals with all aspects of the agriculture of its region except tobacco, and there it works by offering its facilities and co-operation to the Tobacco Research Board.

As its main task the Station is seeking means of maintaining and raising soil fertility. It is believed that the sandy soils of the region, once brought into cultivation, can best be preserved for continuing agricultural use by alternating the crops with grass and grass-legume leys, and much of

the work of the Station derives from this belief. At present, however, most of the arable land is still virgin, and provides some of the best natural grazing in the country; some study, therefore, is made of the management of natural grassland. There is some work, too, with irrigation, and with vlei land, to provide green feed for the long dry winters.

The Pasture Research Sub-Station at Melsetter, administered from Grasslands since its start in 1949, was handed over to the Chief Pasture Research Officer in January.

Weather. Rainfall was fairly well distributed, with a short dry spell in January and a longer one in March. The total for the season, from 1st July, 1956, to 30th June, 1957, was 37.86 in., that being 1.64 in. greater than the average for the past 23 seasons. The first planting rain came on 5th November, but growth was slow for the first few weeks as it was cool and cloudy. The winter was generally mild, but a very severe frost at the end of May killed much of the Dahl reserved for winter grazing.

Work with Grasses. Grasses, as the basis of the Station's work with leys, continue to be much studied. The "Sabi" selection of *Panicum maximum* has graduated from the Nursery, and 17 acres of it have been planted. It seeds well, is said to be "eelworm-resistant", is productive, and is easy to establish.

Notable among Nursery activities is an attempt to secure a strain of *Panicum coloratum* which both sets viable seed and has the creeping habit — a happy combination not known at present.

Seven of the better ley grasses have been gathered into an experiment to compare their yields and to compare their response to nitrogenous fertilizers. This, the first season, Kazungula Setaria Grass gave the greatest average yield, and Star Grass the smallest. Much of the difference between species appeared to lie in their responsiveness to nitrogenous fertilizers.

It is now well established that nitrogen is the main need of sandveld soils for growing grasses abundantly. With this clear, attention turns to learning how to use nitrogenous fertilizer most effectively. Experiments on dryland pastures this year, to compare various programmes of applying nitrogenous fertilizer over the season, suggest that, for practical purposes, individual dressings act independently of each other; that is to say, the efficiency of a given dressing will not be materially affected by a preceding one, nor itself materially affect the efficiency of a following one. It appears also, for a given quantity of fertilizer, that a small number of large dressings will result in greater yields than a larger number of smaller ones.

In a comparison, on Katambora Rhodes Grass, of the nitrogenous fertilizers sodium nitrate, ammonium sulphate and urea, the yield was greatest with sodium nitrate and smallest with urea. This is not in accord with earlier findings on Star Grass; more work is clearly necessary.

Hitherto, because of the cost and difficulty of pasture experiments with animals, work has been done on small ungrazed plots; this year, for the first time, animals were used. Where Kazungula Setaria Grass was fertilized with 200 lb. of ammonium sulphate per acre, the total gain of Afrikander steers grazing it from 19th December to 5th June was 133 lb. per acre; where it had been fertilized with 600 lb. the gain was 203 lb. per acre. The difference lay in the greater carrying capacity of the more heavily fertilized pasture, not in greater gains per animal.

Now that the growing of grasses is fairly well understood, more attention is being given to studying their management. In the belief that changes in the amounts of carbohydrate and protein in the grass roots and shoots will provide a guide to the best methods of management, techniques for measuring these have been partly worked out.

Work with Legumes. The dearth of nitrogen in sandveld soils, the great cost of nitrogenous fertilizers, the need for richer pastures than can be secured from grass alone, and the need for more pulses in African diets, have all turned attention towards the legumes. They often fail to grow satisfactorily, however, and despite a good deal of work, the reasons for this, and the remedies, have still to be found. This year, with an F.A.O. Fellowship, the Officer-in-Charge of the Station made a special study, in Australia, New Zealand and Britain, of current methods of dealing with the problems of growing legumes. As a result it is hoped that progress will be more rapid.

Two clovers from Kenya, *Trifolium semipilosum* and *Trifolium rueppellianum*, imported with appropriate nodule bacteria, look like being very useful pasture legumes. The former is a perennial with a strong tap-root going down several feet, and the latter a quick-growing and very productive annual.

Seventy-two varieties of soya beans, 28 of lucerne, and 21 of Dahl were grown for observation this year.

In a fertilizer trial with soya beans, 50 lb. of double superphosphate per acre increased the yield of threshed beans from 5.3 to 6.1 bags per acre, with no further increase where more phosphate was applied. Lime, borax, manganese sulphate and sodium molybdate had no apparent effect on yield.

In attempting to establish New Zealand White Clover on a vlei margin, it was found that a ton of lime per acre was as useful as two tons, and that with superphosphate there was a steady improvement in establishment over the range tested (0-300-600 lb./acre). Nitrolime had no lasting effect.

Excavation of lucerne roots showed that they seldom penetrate more than 4 ft. or so into the soil. Where superphosphate and or borax had been applied, roots were found to go deeper. Some varieties were found to go deeper than others, and the deeper-rooting ones gave the greater yields.

Trial of Dahl as a winter feed for beef cattle was continued. This year, because the crop was damaged by a severe early frost, winter gain was disappointingly small (33 lb. per head as compared with 100 lb. last year); it was, however, a gain, and it is clear that Dahl is a good winter feed even when frosted.

Work with Other Crops. Work with other crops was continued and expanded. Most attention was given to maize, the only crop other than tobacco at all widely grown on sandveld soils, but work was started with potatoes, soya beans, ground-nuts and rapoko.

With maize, as with grasses, the emphasis was on finding how to use nitrogenous fertilizers most effectively. In general, with quantities containing up to 100 lb. of nitrogen per acre, at least as great yields were obtained by applying the whole amount about five weeks after planting, as were obtained by applying some of it at planting and/or ten weeks after planting.

Where ammonium sulphate and urea were compared as nitrogenous fertilizers for maize, no practical difference between them was found.

Where maize was planted at three ten-day intervals from 16th November to 6th December, it was found, in keeping with local belief, that the later it was planted the smaller was the yield obtained, the difference in yield between the two dates given being 2.4 bags per acre. Response to nitrogenous fertilizers was much the same for all three plantings.

The effect of weeds on yield was demonstrated most strikingly where maize, kept practically free of weeds, gave 16.4 bags per acre, that hand-hoed once six weeks after planting gave 11.3 bags, and that not hoed at all gave but 4.1 bags.

In co-operation with African Explosives and Chemical Industries, Ltd., and Pest Control, Ltd., various herbicides were tested for controlling weeds in maize on sandveld soil. It was made clear that effective weed control is feasible, but that more work must be done before making recommendations.

Fifteen hybrid maize strains from the Sabi Valley Experiment Station were tested. Several were resistant to *Helminthosporium turcicum* and gave yields as great as those of the better hybrids from the Salisbury Experiment Station.

Fourteen varieties of potatoes from Holland were grown for observation. All were resistant to "Late" Blight but several succumbed later to "Early" Blight.

In co-operation with the Branch of Botany and Plant Pathology, potatoes of the Up-to-Date variety were planted at fortnightly intervals from 14th September to 5th November, to see if, by early planting, the ravages of "Late" Blight could be escaped. With supplementary irrigation as necessary, the earlier plantings gave over 140 bags per acre and the last planting less than 50 bags per acre.

Twelve varieties of winter wheat are being tested for use on vlei land, but are unharvested at the time of writing.

Work with Livestock. Much of the work with livestock lies in measuring pasture production, and is mentioned or implied in other parts of the report.

The nutritional value of common salt is being tested on groups of Afrikander, Mashona, Sussex and Hereford steers. So far no practical difference has appeared between the steers having salt and those having none.

The effect on infertility of feeding ground-nut meal and sodium metaphosphate in winter to Afrikander heifers running on natural grazing is being tested. So far no changes in the oestral cycle or the conception rate have appeared.

A number of well known worm remedies for sheep were tried, separately and in rotation, on infested sheep running on heavily infested pasture. In such circumstances no remedy was found to be wholly effective.

Following severe losses of sheep from "Phalaris Staggers" after grazing on Ronpha Grass, a number of preventive treatments were tried on some Shorthorn steers. Applications of 4 lb. per acre of cobalt sulphate to the grass prevented the condition developing, but daily injections of Vitamin B_{12}, and free access to a salt-lick containing 1 per cent. of cobalt sulphate did not.

The three preceding experiments were done in co-operation with the Federal Department of Veterinary Services.

Work with Soil Fertility. Underlying the work with pastures, crops and stock already mentioned, is the basic need to find farming systems that will maintain and raise the fertility of sandveld soils. As specific problems are analysed, so an assured basis is being provided from which broader and broader experiments are being synthesized to study effects of various practices on soil fertility. In general, the method is to gauge the residual effects of various practices by growing a test-crop of maize afterwards.

The first two long term experiments with leys were ploughed and test-cropped with maize during the year. In these experiments, Star Grass had been fertilized in various ways each year for five years running and cut twice a season as hay. No fertilizers were applied to the maize test-crop. Where lime had been applied to the Star Grass each year, the yield of the maize following was very much greater than where lime had not been applied. Where large amounts of ammonium sulphate had been applied to the Star Grass the yield of the maize following was much reduced; lime countered this effect. Neither super-and-raw-rock phosphate (300 lb./acre/season) nor potassium chloride (up to 225 lb./acre/season) had any apparent residual effect, as the yield of the following maize was much the same whether they had been applied to the ley or not.

Where a Star Grass ley was ploughed at monthly intervals from mid-January to mid-March, it was found that the later the ploughing was done the greater was the yield of maize the following season, the difference in yield between the two dates given being 4.5 bags per acre.

Last season, ammonium sulphate and superphosphate (0-250-500-750 lb./acre of each) were applied to maize grown as the first crop after a Star Grass ley, half of which had been ploughed in March and half in October. Neither the fertilizer dressings nor the ploughing-times had any apparent residual effect on maize grown on the same plots this season.

Both this season and last season, the yield of maize grown, *without fertilizers*, as the first crop after ploughing a well fertilized Star Grass ley was 26 bags per acre. Where a second unfertilized crop was grown this year on the land used for the first crop last year, the yield was 18 bags per acre, and it was found that about 250 lb. of ammonium sulphate per acre was required to raise yield to the 26 bag level again.

In co-operation with the Tobacco Research Board, tobacco was grown as the first crop after a well fertilized Star Grass ley. The yield was very good, but the quality poor.

Two more experiments with duration of ley, grazing intensity, species of grass, and use of nitrogenous fertilizer have been started.

Work with Veld. In an experiment to assess, with steers, the effect of nitrogenous fertilizers on the productivity of reverted grassland, it was found that liveweight gain per acre was proportional to the amount of nitrolime applied up to 600 lb. per acre, with no further gain when more nitrolime was used. In the absence of nitrolime three acres of grazing was required to carry a steer for the summer, and the gain per head was 230 lb.; with 600 lb. of nitrolime only one acre was required, and the gain per head was 250 lb.

In an experiment where natural grassland was mown at various times of the year for four seasons running to assess the effects of defoliation, it was found that the grasses were but little affected, and that prevalence of species other than grass was reduced by defoliation during the growing season. Over the whole experiment grasses comprised about three-quarters of the total weight of dry herbage, and legumes about an eighth.

Other long term veld experiments have been continued according to plan, with no developments worthy of special note.

Work with Irrigated Pastures. An average yield of 1,530 gallons of milk per acre was secured from 17 acres of well fertilized irrigated grass/clover pasture grazed for one year to assess its productivity. Only cows giving over three gallons of milk a day were used, and those giving over four gallons a day were given 3 lb. of dairy cubes a day for each gallon over four. No silage or other feed of any kind was used. The yield without concentrates is estimated at 1,320 gallons per acre.

The clovers were slow to grow, and contributed adequately to the grazing only during the last three months of the test year. For this reason nitrolime was liberally used, the total dressing during the test year being 800 lb. per acre.

Miscellaneous Projects. In routine measurements of percolation and run-off of rainfall it was found, on plots kept bare of vegetation, that 30.26 of the 37.86 in. of rain that fell at the site reached the depth at which measurement was made, namely 75 in. On plots bearing maize and Star Grass the average amount of percolation was equivalent to 18.39 in. of rain, the difference in amount between the bare and the vegetated plots thus being 11.87 in. Run-off and erosion were negligible.

At the gauging weir installed by the Southern Rhodesia Division of Irrigation, run-off for the year 1st October, 1956, to 30th September, 1957, amounted to 4,170 cusec-hours from a catchment of about two square miles.

The herbicide C.M.U., applied at three concentrations and at three rates, had little visual effect on Msasa and M'nondo trees and coppice.

General Station Matters. Ten more houses for African staff and labourers, two small stores, and a small meteorological office were built, and a well was dug.

The Friesland herd was increased from 30 to 35 cows in milk. The herd average for the year for all completed lactations, including those of first-calf heifers, was 9,690 lb. per 300-day lactation.

A hundred Mashona heifers were received on loan from the Southern Rhodesia Department of Native Agriculture for use in fertility studies, and three Afrikander bulls were transferred from the Matopos Research Station for the same purpose.

Sheep grazing on the Station's first pasture of Ronpha Grass developed "Phalaris Staggers", and about three-quarters of the breeding ewes eventually died.

The irrigation scheme was extended to its full size of 40 acres by planting a further 17 acres of grass/clover pasture.

Six acres of trees and about 1½ miles of windbreak were planted.

Twenty-one acres of maize and 25 acres of velvet beans were grown, and some 700 tons of grass silage made.

Some 600 acres of land were handed over to the Director of Prisons for a Medium Security Prison.

There were numerous visitors during the year, of whom 440 signed the Visitors' Book. Sixteen groups of farmers, Conservation Officers, Young Farmers' Clubs and others visited the Station.

Sixty-six lots of grass and legume seed, and 440 bags of roots were issued.

White Grubs were unusually numerous and destructive, and severely damaged about 28 acres of grassland, including the grass nursery.

Acknowledgments. Very generous gifts of fertilizers were received from Messrs. Fisons (Rhodesia) Ltd., Messrs. Windmill Fertilizers (Rhodesia) Ltd., and Messrs. African Explosives and Chemical Industries (Rhodesia) Ltd.

9. MATOPOS RESEARCH STATION

J. M. RATTRAY

OFFICER-IN-CHARGE

Staff. With the exception of the Supervisor's post at Two Tree Kop and a Technical Assistant's post at the Nyamandhlovu Station all vacancies had been filled by the end of the year.

The Officer-in-Charge was appointed as a Consultant to the Food and Agriculture Organization of the United Nations in Rome for a period of five months (April to August), in order to compile a map of the major grass associations of Africa. Most of the country south of the Sahara was completed.

Native School. This continues to function successfully with some 73 children attending (39 in Sub A, 14 in Sub B, 10 in Std. I and 10 in Std. II).

Beer Hall. Brewing under permit was introduced earlier in the year and appears to be working very satisfactorily.

Climate. Although the total rainfall was 25.8 in. for the season, it was very unevenly distributed and two dry spells occurred. However, in spite of this, nearly 600 tons of maize silage were made and 770 bags of maize reaped. Bean hay yields were over a ton an acre and about 140 tons were made.

General. A successful Farmers' Day, opened by the Hon. Minister of Agriculture, was staged in March and some 250 people attended.

A large number of Farmers' Association meetings, and I.C.A. Field Days were attended during the year, and numerous addresses given by various members of the Staff.

The Station was as usual visited by a large number of visitors.

The Station's Friesland bull, Bootsma, established a record by winning the Thousand Guinea Trophy on the Bulawayo Show for the second year in succession.

PASTURE RESEARCH

Four blocks of quarters were built for native labour at Two Tree Kop and a new workshop was constructed at the Nursery. Twenty-four acres of sandveld at Lonsdale were ploughed and sown to Rhodes Grass. The 24 acre Bambatsi land was fenced into smaller paddocks. Two arable lands on heavy soil were planted to Panicum Zhilo and Rhodes Grass respectively. A new firebreak was stumped on the Lonsdale-Lucydale boundary. Internal fencing from the concluded veld trials has been removed.

Veld Management Trials. Experiments 1, 3 and 5 on thornveld and Experiments 7 and 9 on sandveld were concluded in June. Experiments 1 and 7 are two paddock, one herd systems, Experiments 3 and 9 are four paddock, one herd systems and Experiment 5 is a four paddock

system on cleared thornveld. It was decided that these had run for a long enough period and in the case of Experiments 3 and 5 the same systems are being used respectively in E30 and E29. (Randomized stocking rate trials.) Experiment 8 on sandveld is grazed in summer only and burned every three years. It is an area of thick bush which is being successfully killed by the periodical fire and the trial is to continue.

There is now sufficient evidence to indicate from the animal, veld and economic points of view that an elaborate system of veld management is not required. The continuous grazing treatments in Experiment 30 have continued to give superior weight gains per acre with, so far, no deterioration to the grass composition, although the lack of fire may lead to increase in bush and localized rankness in the grass. The system, which shows the best economy of fencing together with a periodic rest and burn, is the three paddock, four herd system in which a paddock is continuously grazed for three years followed by a rest for a year during which time it is burned at the end of the dry season to control bush and eliminate old rank grass. This system has run for three years on sandveld (E37) at four stocking rates. Cattle were taken out in June and the whole area will be burned in October and rested until about January when it will be stocked for a further three years. Highest liveweight gains per acre have been obtained at the heaviest stocking in E37 (1 : 8 acres).

Fencing of two new grazing trials has been commenced on the site of Experiments 3 and 5. These will also be managed under the three herd, four paddock system and there will be five stocking rates, ranging from six acres to 15 acres per beast, a lower range than has hitherto been used.

Steers on winter grazing have lost weight rapidly except a urea supplemented group.

A trial with cattle and goats at different stocking rates has been planned and the perimeter laid out.

Feeding Trials. During the latter part of the dry season, a feeding trial was carried out with young steers to compare bean hay, cotton seed cake, *Acacia subulata* pod meal and *Piliostigma thonningii* pod meal. All groups received veld hay in addition. The *Acacia subulata* group have shown up unfavourably as the steers have been reluctant to eat the meal.

Bush Control Trials. Observations have continued on earlier trials with hormone weed-killers, but no great success has been achieved. The best kills have been on mopane stumps at Tuli where 245T gave 60-100 per cent. kills but generally results have been poor.

A new trial involving 300 trees of five *Acacia* species was carried out. 245T butyl ester in oil and water, ammate and diesel fuel were applied to cuts and a ring barking treatment was included. First observations will be made in the 1957-58 season. A new trial was also carried out with C.M.U. at higher concentrations than the original trial which has not proved a success.

Veld Fertilizer Trials. Responses to nitrogen were poor on black and red soils but good on sandveld.

Ecological Trials. An interim report on the isolation transects (Expts. 16 and 17) was published in November, 1956. Striking deterioration of perennial grass cover and increase in size of scrub have been recorded on the red soil.

Changes in seasonal grazing and burning experiments are less drastic. Annual burning is damaging trees but a stunting of perennial grasses is occurring with accelerated run-off.

Only bare plots have so far shown significantly greater run-off and soil loss in the run-off plots. No percolation was recorded in the red soil lysimeters at the collecting depth of four feet.

Botanical Analysis. A considerable amount of botanical analysis has been carried out by point and ring methods in ecological and veld management experiments. The point method has been found unsuitable for veld and a comparative trial was carried out with three methods. Methods and data have been discussed in detail with the Biometrician on this difficult and fundamental problem.

Dryland Pastures. No critical grazing trials have been carried out yet but successful establishment of several areas (to Rhodes Grass and Panicum) has been carried out as reported above.

Two trials with Napier Fodder were completed, E39 (frequency and height of cutting) and E40 (grazing and cutting trial). Over the five years of both experiments significant differences between treatments have been obtained. The more frequent cutting and grazing treatments have given the lowest yields but a higher quality forage. Grazing or cutting near to ground level gives inferior yields to grazing or cutting at some height from ground level. One Napier Fodder experiment continues, E53, a fertilizer trial. No response to P or K was obtained in the 1956-57 season. Napier Fodder responded to N at the low level only.

Plot trials were carried out with a number of legumes to study the nutritive value and effect of frost throughout the dry season. The established dryland lucerne on red soil and sandveld has survived two and three winters respectively and produced new leaf about August. One and a quarter acres of lucerne sown with Rhodes Grass failed due to ineffective nodulation.

Irrigated Pastures. Comparison of sheep grazing days per acre has been made for the following pastures over the dry season: Ronpha, Tall Fescue, Italian Rye Grass, Kikuyu, Lucerne and

Oats. Cocksfoot was also established. All grasses and clovers have a period of slow growth in winter. Seventy-four frosts were recorded on the ground thermometer at the Nursery.

General. The staff situation was unsettled with one Professional Officer and one Technical Assistant transferring from the Section and two new professional officers recruited. An African Assistant was absent for six months on medical grounds. The labour position was satisfactory.

The rainfall season was about average with a variation from 18 in. to 28 in. at different experiment centres. All non-supplemented groups of steers lost weight rapidly during the dry season. One hundred and forty-eight steers from experiments and loose groups were slaughtered at the Cold Storage. Two hundred and seventy steers of three age groups (approximately 15 months, 27 months and 39 months) arrived from Central Estates, Umvuma, in March. These were purchased by the Cold Storage Commission and will be used in the grazing trials.

Staff were involved in advisory and extension visits to farms and Native Reserves during the year. A number of visitors were shown round the experiments.

ANIMAL HUSBANDRY

Development. During the period under review, favourable progress was made with regard to essential capital improvements for conducting the beef production trials, in which the profitability of rearing beef stock on free range will be compared with more intensive systems of feeding.

On Lucydale Farm an overhead irrigation plant was installed to irrigate 60 acres of land. The existing tower silos were enlarged to hold 130 tons of silage each and a feed room to hold 60 tons of ground bean hay was built. In addition five more paddocks were erected to progeny test beef bulls under different systems of management.

As a result of the termination of the Cyrene lease and the changes which were introduced in the beef breeding experiments capital expenditure on the main Station and Tonbridge Farm had to be limited to repairs of existing fences, cattle kraals and watering points.

Research — Nutritional Trials. There is much speculation as regards the extent to which beef production in this area can be increased economically by producing high quality fodder crops for winter use.

From experimental evidence it would appear that a large variety of crops can be produced locally but, from a practical point of view, no information is available to indicate whether sufficient quantities of feed can be produced to winter beef stock profitably on the average sized farm. Experiments are, therefore, in progress to determine the cost of beef production under conditions of winter feeding as compared with the rearing of cattle on free range.

From the results obtained so far it is clear that by wintering cows with calves on home grown feeds calving rates can be raised to over 80 per cent. as compared with an average calving percentage of 60 per cent. for cows on free range. Furthermore, calves so treated are at weaning roughly 30 per cent. heavier than similar groups reared on veld grazing only. At the same time the mortality rate, from birth to weaning, of about 8 per cent. in the veld reared groups may be expected to be virtually eliminated in the calves which are fed with their dams in winter.

These results clearly show that beef production can be increased very considerably by wintering beef stock on home-grown feeds, but it is evident that the success of such a scheme will depend primarily upon the amount of feed individual farmers can produce successfully in addition to their normal stock duties.

These experiments are therefore being continued to determine the major physical factors limiting the production of stock feed on the average sized ranch in this area.

Cattle Breeding Experiments. The differences obtained in reaction between breeds to varying environmental conditions are generally ascribed to differences in the environments in which the various breeds were developed.

A survey of the literature, however, reveals that very little information is available with regard to the extent to which such differences occur between individuals within breeds.

From a livestock improvement point of view, information of this nature becomes of special practical importance, particularly when it is considered that we are continuously importing stud stock from areas differing greatly with our local conditions. In order to determine to what extent genotype-environment interactions occur between individuals within breeds and to what extent different systems of selection may influence the prevalence of such interactions, two closed herds of Afrikander cattle are being selected for increased production on free range and under conditions of winter feeding. Four bulls are being progeny tested under each system each year and, after a number of generations, the treatments will be reversed to assess the influence of management on the effectiveness of selection. At the same time registered Afrikander bulls, selected on conventional standards of breed perfection only, are being progeny tested under conditions of free range and winter feeding. This experiment has now been in progress for a year and the first calves from these mating systems will be dropped during the coming season.

Adaptability Trials. From the results obtained from previous experiments it has been proved conclusively that the British breeds of beef stock are unable to thrive under local conditions of free range.

There is ample evidence to show that malnutrition in winter is mainly responsible for the relatively poor performance of the imported breeds, but apart from this no analysis has yet been made of the individual factors limiting the production of the exotic breeds under local conditions of fluctuating food supplies.

As large sums of money have been invested in the exotic breeds, experiments have been planned to determine how these breeds should be managed to obtain optimum performance under commercial systems of farming. In this investigation a critical comparison will be made between Native and Hereford cattle as regards their grazing habits and their susceptibility to internal parasites when subjected to varying systems of feeding.

Mutton Production. The breeding of smooth-coated sheep from Dorset Horn x Blackhead Persian crosses is progressing favourably and a stage has now been reached where it is possible to progeny test smooth coated rams for more desirable mutton characteristics. Trials have also been conducted to determine the effect of protein and mineral supplementation on mutton production. From the results obtained so far there has been no advantage in feeding minerals and it would appear that animal production in this area is mainly limited by the pronounced deficiency of protein in the winter pastures.

General. On the whole, the period under review has been a favourable one, and as in the past members of the staff were frequently called upon to assist the Extension Department with numerous field problems.

FIELD HUSBANDRY

Development. Only minor alterations, extensions and improvements were made to buildings and installations. Theft remains a major handicap to research work and fencing has received as much priority as possible. Land levelling for irrigation has received much attention.

A number of staff changes during the year have caused considerable inconvenience.

Research. The season's total of 25.87 inches was the only satisfactory feature of the rainfall; two dry spells considerably reduced yields. Plant diseases were not prevalent and the only serious pests were aphids, particularly on the sorghums. Plant stands were much improved by good control of rats and mice and by germination tests to ensure the use of good seed.

The use of a grain moisture meter reduced difficulties, and chances of errors, on the threshing floor as well as allowing standardization of yields with respect to moisture content.

Variety Trials. In the commercial maize variety trials, Teko Yellow, 50H35 (N3 × A5), and Kroonstad Robyn, were the top yielders while Salisbury White, Hickory King and Southern Cross were the lowest yielders. The mean yields of the two trials were 10.05 and 12.05 bags per acre.

In a trial of maize breeding material, material from Sabi Valley Experiment Station, Natal University and Potchefstroom College of Agriculture showed most promise; the mean yield was 13.76 bags per acre.

The sorghum variety trial, with 61 entrants, had a yield mean of 10.4 bags per acre.

The trial on Castor Beans showed significant differences between the four varieties grown; yields ranged from 93 to 987 lb. per acre of decorticated seed (with time of planting taken into account).

Fertility Trials. The only response to fertilizers on the heavy soil was a significant, but uneconomic, increase in maize yield of a bag an acre from the application of 40 lb. per acre of nitrogen at either mid-winter or at planting.

The various stubble treatments in the mulching trial did not differ.

On the granite sands significant increases in maize yields were obtained from 80 lb. per acre of phospherous but not from 100 lb. per acre of nitrogen: sorghum gave no responses to these fertilizer levels; the mean yields were: maize, 8.37 bags per acre and sorghum 4.55 bags per acre.

In a manurial trial on the sand, the residual value of 15 and 20 tons of organic matter significantly increased maize yields, with kraal manure better than compost.

At Nyamandhlovu, fertilizer trials were conducted on both the basalt and kalahari soils. On the basalt neither maize nor sorghum responded to nitrogen or phosphorous, mean yields were 11.51 and 3.88 bags per acre respectively. On the kalahari sand, maize yields were significantly increased by both nitrogen and phosphorous.

Espacement Trials. With maize there was no difference in yield in the population range of 9,680 to 14,520 nor between wide (six foot) and narrow (three foot) row spacings; there were however, increases of 1.67 and 1.01 bags per acre on the clay and sand respectively between 7,260 and 14,520 plants per acre.

Sorghums responded to spacings on the heavy clay soil; yields of double dwarf and a dwarf variety increased from about nine to 22 bags per acre over the spacings range 36″ × 10″ to 12″ × 2″. At Nyamandhlovu the opposite effect was obtained, sorghum yields being reduced by closer spacing. On the granite sand at Matopos this range of spacings did not affect yield.

Castor beans showed no yield differences in the spacing range 36″ × 6″ to 36″ × 24″. Both castor beans and potatoes gave significantly higher yields with early planting.

Silage Crops. On heavy clay soil varieties of maize, sorghums, millet and sunflower, were compared for silage yield. The addition of beans made no difference to yields and there was also no difference between the maize, sorghum and sunflowers; millet and the legumes alone yielded less than most maize and sorghum varieties. Yields ranged from 19.82 to 5.38 tons per acre.

In the same trial on granite sand sorghums, millet and sunflower yielded lower than maize. Yields ranged from 11.94 to 3.24.

In a silage sorghum spacing trial on the heavy soil yields were raised from 8.37 to 21.01 tons per acre by decreasing the spacing from 36″ × 10″ to 12″ × 2″; both in-row and between-row spacings had significant effects on yields.

Hay Crops. A spacing trial on the heavy soils demonstrated the value of close spacings for cowpeas; yields were raised from 1.17 to 2.50 tons per acre by close spacing. Velvet bean yields were not affected by similar spacing treatments. A similar trial on sunnhemp indicated that wide between-row spacings and close in-row spacing was optimum.

Rotation and Cultural Trials. The stubble mulch trial gave no maize yield differences between stalks ploughed in, mulched, removed and replaced with two tons of compost, and there were no interactions with nitrogen application from nil to 120 lb. per acre.

Lister planting was compared with flat planting on both the heavy soil and granite sand; on the former soil maize grown in lister furrows outyielded flat plantings by 1.24 bags per acre but on the granite sands no increase was obtained.

Irrigation Trials. The lucerne variety trial was continued and a few varieties are now yielding consistently better than others.

In a supplementary irrigation hay crops trial, dolichos beans with 2.34 tons per acre and soya beans with 2.31 were top yielders; cowpeas, *Crotalaria intermedia* and velvet beans had yields between 1.83 and 1.98 tons per acre.

Maize and sorghum, each alone and with cowpeas or velvet beans, were compared for silage yield under supplementary irrigation. Both the cowpeas and the velvet beans were smothered by the growth of maize and sorghums and made little or no growth. Sorghum outyielded maize, the yields being 22.76 and 17.23 respectively.

Plant Breeding. With the appointment of a plant breeder during the year, plant improvement and breeding work should now go ahead on a sound basis.

Maize. The work, started in 1956-57, of testing all material on hand continued during the year and further selections were made from open pollinated varieties, particularly those locally adapted. Eighty-one S2 lines and 962 S1 lines are under test at present and there are 29 lines surviving from work done prior to 1955-56. The first test crossing for general combining ability ever carried out at Matopos was done during the year. At the present time both yellow and white material is in the programme.

The work planned in the immediate future is to be based on adequate variety trials of commercial varieties in different areas, production of varietal and top-crosses, synthetics and possibly conventional double hybrids, using early testing techniques.

Sorghum. Evaluation in nursery rows and yield trials combined during the year for both grain and forage purposes. Breeding work is unlikely to start until the present unwieldy amount of material has been reduced to reasonable proportions, based on suitability to local conditions and until some assessment is made of the effect of environment on yields. There is, for example, some evidence that those varieties doing well in warmer areas (Nyamandhlovu and Gatooma) do not yield well at Matopos.

Millet. Observational work and some selection for the awned condition and for silage type continued again this year. Unfortunately the climate locally is unsuitable for breeding millets that are to be of value in warmer, drier areas. It is hoped to start some investigations on the amount of improvement that may be expected from millets in early generation synthetics, but this work will require the co-operation of the staff of some station in a millet growing area.

Miscellaneous Studies. Preliminary observational work was done on soil moisture, soil temperature and controlled environment studies. No conclusions were reached but indications were given for future work.

POULTRY SECTION

A new block of breeding pens, consisting of six compartments, each of which can accommodate 15 hens and one cock, is in the course of construction. Two compartments are complete and already in use.

Research. A number of pilot feeding trials and hormone caponising trials were carried out. The mash used in the feeding trials was donated by various milling companies, and the results indicated that there was considerable variation between the various mashes tried.

The caponising trials with Hexoestrol also gave varied results. Hormones seem to interfere with the metabolism of certain amino acids required for feather pigment, and cannibalism and diarrhoea also appear to be more frequent with hormone caponising.

A long-term feeding trial with Terramycin is at present in progress. The object of this trial is to ascertain the effect of continuous feeding of Terramycin at a low level—ten grams to the ton (2 lb. terramycin compound)—on growth rate, liveability, hatchability and fertility. So far the results have been disappointing. Birds receiving the Terramycin weigh less than the controls, and their feather pigment also appears to have been affected. This experiment has now been replicated.

General — Extension Work. During the year 130 farms were visited. The demand for visits is ever increasing, but the mileage allowance is inadequate for carrying out this work efficiently.

Visitors. Farmers are now beginning to visit the Section more regularly, and it is hoped that once enough accommodation is available to house the birds, trials will be in progress continuously. This should help to encourage an even larger flow of visitors.

Shows. No exhibit was staged at the Bulawayo Show this year. The Poultry Officer officiated as judge at the Bulawayo, Gwelo, Livingstone and Lusaka shows. The birds exhibited at the Gwelo Show were the best seen over the past seven years. Exhibits at the other shows were disappointing especially those at Livingstone and Lusaka.

Between the Livingstone and Lusaka shows a short tour was made of the territory. The impression gained was that the poultry farmers were not receiving sufficient guidance owing to the fact that the Extension Officer concerned had numerous other duties to attend to. It is believed that this has now been rectified and that a full time Poultry Officer has been appointed.

Marketing. Egg prices fluctuated during the year. The lowest price paid was 1/3d. per dozen by retailers and 1/4d. on the Bulawayo Municipal Market. At this low price farmers cannot make a profit and a number of smaller farmers were forced out of production and bigger farmers had to cut down on numbers. Serious consideration will have to be given to a comprehensive orderly marketing scheme, if the industry is to be put on a firm basis.

General. A very successful farmers' day was held at Mr. Robinson's farm at Gwelo. About 50 farmers attended and great interest was shown in the production of eggs and table birds in cages.

A disease known as Contageous Respiratory Disease, and certain deficiency diseases have caused serious losses to farmers during this year. These diseases need investigation if table bird production is to be encouraged.

TULI PASTURE SUB-STATION

One new trial occupying 100 acres was laid out and fenced. Improvement and maintenance of roads, fencing and gates was continued.

Research. The veld trials ran steers of three age groups as from October, 1956. All groups gained an average of about 300 lb. liveweight from October to the end of April when peak weights were attained in most cases. Few differences are apparent between systems of management or stocking rates except for the 1:15 acre paddocks in experiments one and three, which fell away sharply from the beginning of May. Differences between cleared and bushed paddocks have shown a small advantage to the cleared paddocks but this is probably not significant. However, dry matter yields of grass per acre were twice as great in a cleared area, approximately one ton and ½ ton respectively.

A new grazing trial involving cattle and goats has been fenced and stocked. Observations will be made on the effect on vegetation of goats alone, goats with cattle at two stocking rates and cattle only as a control.

A botanical survey, involving preliminary mapping of paddocks, species lists and frequencies, has been carried out in experiments one, two and three. Fixed point photographs are also taken in all paddocks. Phenological observations on vegetation have been made throughout the year.

General. A new L.D.O. took over local control of the experiments but was absent on other duties for four months. The labour position was satisfactory.

The rainfall season was about average, 15.77 inches being recorded at the pasture block.

An accidental fire burned out experiments two and eight in September, 1956.

NYAMANDHLOVU PASTURE SUB-STATION

Climate. Good planting rains fell in early November and although the total rainfall recorded was 20.33" the distribution was fair with two dry periods in December and January. The seasonal rainfall was about average and therefore it was a good year for evaluating grazing experiments. Although the winter was extremely mild, cattle started losing weight early and generally had lost more weight than in preceeding years by the end of September.

Development. The new office was completed and in addition two blocks of African quarters were built which will house four families. Adjacent to these blocks an ablution block and laundry were built for the African labourers.

It was decided at the 1956 Research Advisory Committee meeting that experiments 2, 5, 6, 8, 9, 10, 16, 17 and 18 would be terminated since they had served their purpose in their present form.

At the 1957 Research Council Meeting it was agreed that a replicated stocking rate trial at different levels would be laid out on cleared black clay to be ready for first grazing in June, 1958. Also that a replicated stocking rate trial at different levels would be laid out on the Red Sandy Loam to be ready for grazing in January, 1959.

It was also decided that replicated one herd, three paddock and three herd, four paddock systems would be started in the Kalahari sand as soon as time and money permitted; the same applied to the start of the couch experiment.

Research — Kalahari Sand (summer grazing). Again the cattle weight increases were less in the unburnt experiment three than in the others, the differences however, were not large. Burning in the sandveld is definitely a comparatively quick and effective method of controlling and reducing bush growth.

Basaltic Clay (winter grazing). The yield of hay for the season was 0.6 tons per acre which is the lowest yield since 1951.

Although the cleared paddocks in experiment 14 were carrying 66 per cent. more cattle than the uncleared ones the weights at the end of the dry season were only slightly in favour of the uncleared paddocks. It would appear that one beast to six or seven acres is the right stocking rate for winter-grazed, cleared, black clay veld.

Red Sandy Loam (year-round grazing). In the stocking rate trial the 1:12 group ended up with the highest weights at slaughter, but there was very little difference between this group and those grazing at 1:40 and 1:26 acres.

The 1:8 group after two average rainfall years, however, have fallen right away and when they went in for slaughter were 300 lb. less in liveweight than the 1:13 group. The veld in the 1:8 paddocks has definitely deteriorated and even after a full growing season's rest will not carry a burn. The trees and bush are denser in the 1:8 paddocks.

The difference in final weights of the steers on the one herd, four paddock as compared with the three herd, four paddock system is negligible but still in favour of the three herd, four paddock system and there appears at this stage to be no veld deterioration in the latter. There is therefore no justification for using the more expensive one herd, four paddock system on this veld type.

The year round non-rotational grazing of couch at 1:6 has given excellent results. The steers off the couch were second only to the three herd, four paddock group in average cold dressed weight at slaughter.

Ecological Observations (red sandy loam). In the veld fertilizer trial the response to fertilizer as expressed in hay-yield was in the proportion of 1:2:4 (control, medium application, and heavy application).

This is substantially the same as the response obtained in the previous season. In the seasonal grazing experiment bush is increasing in all plots, but the least increase is taking place in the complete protection plot and in the dry season grazed plot. In the isolation transect recovery of the veld is slow and patchy.

Dryland Artificial Pastures on Red Soil. All plots were fertilized at the rate of 150 lb. each of sulphate of ammonia and superphosphate. The yields were considerably lower than in the first year of yielding, the best being Zeerust Cenchrus at two tons of hay per acre and Creeping Makarikari was second at 1.75 tons per acre. The Napier Fodder was only cut in May and yielded four tons per acre of semi-dry material.

Crop Experiments and Trials. Maize and sorghum fertilizer/espacement trials were run on the Kalahari sand and Black Basaltic clay lands. Plainsman sorghum and Sahara maize were used on the sand. The Plainsman was a failure because of aphid and borer attack. Espacement in the maize varying from 7,000 to 12,000 plants per acre did not significantly affect the yield. The response to nitrogen, however, was highly significant, and at the lower populations there was a response to phosphate.

In the Black Clay trials the maize responses could not be accurately determined because of bad stands in some plots. There appeared, however, to be an important response to phosphate, The Plainsman showed no response to fertilizers but a significant response was obtained in favour of the lower population rates.

Of the other crops grown Salisbury hybrid yielded 16 bags per acre in the sand and all the legumes yielded well, whether for seed or hay. Thirty tons of legume hay were obtained from 17 acres planted. The best silage crop yield was Ribbon Cane at 14.75 tons per acre from the black clay land.

Umkouzaan. Of the 17 small plots which were sprayed with various chemicals by Pest Control at the beginning of the 1956-57 rainy season, the 245T plots appear to have reduced the growth of Umkouzaan most successfully. The only plot in which there has been no regrowth is the one sprayed with 245TP. However, 24D has greatly reduced the Umkouzaan growth and, because of it being much cheaper than 245T, it may be better from a practical point of view to use it even if 2-3 sprays are necessary to get a complete kill.

Starting in July, 1957, ¼ acre plots have been spot-sprayed with a 0.75 per cent. by weight solution of 245T and 24D with water, at four weekly intervals to observe the most suitable time for application. The effectiveness of 24D as compared with 245T will also be noted.

10. THE SABI VALLEY EXPERIMENT STATION

P. D. WAISTER

Acting Officer-in-Charge

General. The Sabi Valley Station was established in 1951 to explore the possibilities of irrigation in the Sabi-Lundi Valleys, where it has been estimated that over 200,000 acres could eventually be brought under permanent irrigation.

Climatic conditions in this sixth year have been generally favourable for irrigation farming and crop yields have been encouraging. Where yields have been poor it is suspected that lack of adequate land preparation or late-planting have been the major limiting factors.

Weather. Rainfall for the year was below average and African grown dryland crops in the area were in the main a complete failure. Problems of waterlogging and surface drainage on the irrigated lands were not as serious as in previous years.

One light frost was recorded in June and caused a temporary set-back in growth in the banana plantations.

Station Development. The water supply line to the farm was completed and two new houses at the farm site were then occupied. Communications were improved by the provision of an internal telephone line between farm, pump station, and office. A new canal of twice the capacity of the old one was provided for the irrigation of the half-acre plots of the pasture block and has greatly increased the ease and efficiency of water applications. The main canals were equipped with Parshall flumes and automatic recorders making possible the measurement of total quantities of water supplied to the Research Station and to the Development Farm.

Some difficulty was experienced during the year with irrigation water supplies due to occasional breakdowns of the ageing pumps and engines. Reconstruction is under way and a reliable supply with adequate provision for breakdowns should be available before the 1957-58 summer planting season. A new dairy and a poultry house were erected at the farm site and a cattle weighbridge installed.

Staff. There were several staff changes during the year, but at the 30th September, 1957, the only posts unfilled were those of Officer-in-Charge and Animal Husbandry Officer, this latter post having been vacant now for three years.

The Soils Physicist was on study leave in the United States throughout the year.

FIELD CROPS RESEARCH

Maize. Except in the case of late-planted maize, yields were satisfactory. Early summer planting is essential both from the point of view of general growth and development, and to avoid serious attacks of virus streak and rust.

Mean yields from a hybrid variety trial planted over a range of planting dates varied from 22.6 bags per acre (planted 29th November, 1956) to 8.6 bags per acre (planted 28th January, 1957). A very hot dry period in February, with maximum temperatures up to 105°F., probably reduced yields of late planted maize considerably. Even with frequent irrigation, rate of water uptake was insufficient to prevent wilting and this was probably exaggerated due to shallow rooting.

Land preparation methods including rotavating, discing, and ploughing, with and without subsoiling produced no differences in maize grain yield. This trial is situated on an area which has

been under cultivation for only three years and may not show yield differences due to cultivation practices for a few more years. There is evidence to suggest that on older lands which have undergone intensive cultivation for five or six years the shallow seedbed produced by the use of the rotavator alone is unsatisfactory.

A nitrogen and phosphorus fertilizer trial showed no yield response to phosphate dressings even in the presence of very high nitrogen applications. To date there has never been a significant response to P or K from any crop on the Station soils.

A trial was conducted to test the response of maize to various nitrogenous fertilizers. N was applied at 80 lb. per acre in the form of ammonium sulphate, nitrolime, urea, sodium nitrate, and ammonium nitrate. The top yield of 17.3 bags per acre was produced by ammonium sulphate and the poorest yield of 11.1 bags per acre by ammonium nitrate. Soil analyses are not yet available but may indicate the reason for this difference in response.

The maize breeding programme is restricted to yellow maize, in which increasing interest is being shown in the Federation. The object is to produce a hybrid more rust and streak resistant than the presently available white hybrids, with increased resistance to lodging. Selections for streak resistance have been disappointing and further sources of resistant material are being sought. Rust resistant material of South American origin, obtained via Kenya, was tested and several promising lines have been selected for inbreeding.

The single hybrids produced during the 1955-56 season were tested at Sabi and at Grasslands Research Station, and at both centres a number yielded as well as the standard white Salisbury Double Hybrid No. 1.

Lucerne. Varietal testing continued. Varieties Caliverde, Morocco, and Hairy Peruvian yielded over nine tons air-dry hay per acre in the first year of establishment. All three are highly susceptibe to rust, which is of minor importance when the crop is cut early for forage, but restricts seed yield, as the plants may be almost completely defoliated just after the peak flowering period.

Grass encroachment continues to be a problem in two and three year old stands. A range of fertilizer trials, incorporating N, P, K, Ca and minor element combinations, has produced no significant growth responses. There were no yield differences from lucerne in 18″ rows machine cultivated, 12″ rows hand cultivated, and 6″ rows not cultivated.

Lucerne caterpillar can cause appreciable damage but has been controlled by applications of Malathion. The possibility of biological control by parasitic virus is being explored by the Entomology Branch in Salisbury.

Cotton. Cotton yields this season were very satisfactory. All plots were either sprayed with Endrin or dusted with DDT/BHC for insect control, and damage was light. Out of over 14,000 lb. seed cotton harvested from all trials, less than 200 lb. were badly stained. The mean price obtained was 9.2 pence per pound (first grade in the 1956-57 season was bought at 9.5 pence per pound). Endrin spray at seven day intervals was the most effective of the treatments in an insect trial.

A planting date and spacing trial demonstrated once more the value of early summer planting and indicated that optimum between-row spacing is 4ft. Mean yields for 4″ within-row spacing were greater than for 8″ or 16″, but the differences were not significant. The wider row spacing makes for greater ease and accuracy of application of insecticide.

Application of 60 lb. of nitrogen (30 lb. as a planting dressing and 30 lb. top dressed at first-bud stage) produced a 350 lb. per acre increase in seed cotton yield over control (2,375 lb. as compared with 2,017 lb.). A seed rate and planting depth trial confirmed the need for heavy seedings at not more than 1″ depth where the seed is dry-planted and "irrigated up", on soils prone to surface crusting.

Results of strain selection trials conducted under the direction of the Gatooma Research Station will be given in the report from that Station.

Wheat. In view of the heavy rust attack in the 1956 season, it was decided to curtail agronomic trials and concentrate on increasing seed of those varieties known to be rust-resistant, and on selection in hybrid material and introductions. Wheat was, however, planted where required by a rotation schedule.

All rotation plantings were made in the second and third weeks of April using varieties Kenya Governor and Smooth Nyanyadzi, both susceptible to rust. These early plantings largely escaped attacks of stem rust. Material for rust resistance testing was planted at the end of April and showed a moderately heavy infection at harvest, permitting selection of the more resistant strains.

Wheat following a two years lucerne break outyielded wheat after two years continuous grain cropping, the former receiving a dressing of 20 lb. nitrogen per acre and the latter 50 lb. nitrogen.

A total of 24″ water applied in 3″ irrigations at 15 day intervals, produced a mean yield of 12 bags per acre. Where 15″ was applied in 3″ irrigations, with a period of 50 days between

the first two irrigations, and three irrigations at 20 day intervals thereafter, mean yield was 9.6 bags per acre. These differences were not significant at the P=0.05 level. A number of tensiometers of the vacuum gauge and mercury manometer type were used in this trial and performed well enough to merit further trial and accurate calibration.

Barley. Atlas California topped the list in the barley variety trial. All barley produced this season had poorly filled grain, apparently due to shortage of water. More information is required on the timing of the later irrigations.

Rice. A top-dressing of 60 lb. nitrogen per acre, applied to a ratoon crop, produced a yield increase of 810 lb. grain per acre over control (3,190 lb. and 2,380 lb. per acre respectively).

The first crop from a rice variety trial was severely damaged by birds and yield differences were non-significant. A ratoon crop was harvested and the variety Century Patna gave the top yield of 3,351 lb. per acre, and was ready for harvest nearly a month before the other varieties tested.

Preliminary observations on the growth of a maize crop following two years of swamp rice suggest that rice may be of considerable value in rotation on the poorer Valley soils.

Sugar Cane. Cane was harvested only ten months after the previous cut, and yields were consequently somewhat reduced. Over a three-year period the varieties CO421 and CP-29-291 have averaged 52 tons and 43 tons cane per acre per annum respectively. Observation plots of CP strains 44-155, 43-47, and 44-101 gave yields of 24, 20, and 49 tons respectively. These three strains gave mean sucrose and purity figures of 15.7 per cent. and 84 per cent. compared with the 11.5 per cent. and 67 per cent. of CO421.

Legumes. A range of legumes was planted for observation on possible use as forage or green manure. Dolichos bean grows extremely well regardless of planting date. For winter plantings, field peas, vetches, and lupins deserve further trial. Sweet clover, sown in mid-winter, has established particularly well. Of the clovers planted, only Chilean Red has shown any promise.

Fruit Crops — Pineapples. Cayennes produced nearly three times the yield of Queens. Severe damage was caused by mealy bugs.

Bananas. Unthinned trees of the Dwarf Cavendish variety again outyielded thinned ones in a methods of thinning trial, where trees were spaced at 6′ × 12′. Mean yield from the unthinned plots over the last two years was 25 tons per acre per annum, and the quality was high.

Dates. In the sixth year from seeding about 10 per cent. of the palms flowered. Several are bearing well but it is doubtful whether they will ripen adequately during the rainy season.

Green Manuring. Cotton following a green manure crop yielded no better than that following cash cropping with maize and wheat. There were no yield differences from maize following a number of legumes grown for green manure. Interplanting of maize with sunnhemp and cowpeas at the kneehigh stage produced no decrease in maize yield compared with clean cultivated control, nor were there any differences in the yield of the following barley indicator crop.

Soil Physics and Laboratory Studies. Physical determinations were continued on soil samples collected before the Soils Physicist left for the United States. The majority of these samples came from virgin land surrounding the irrigated areas and they should afford a basis for measurement of the effects on soil structure of land preparation and subsequent irrigation and cultivation practices.

Additional apparatus was received during the year and the laboratory is now reasonably well equipped to deal with the soil physical studies planned. Much basic information on soil structure and water relationships must be obtained before agronomic trials can be extended or the results of existing ones can be correctly interpreted.

Animal Husbandry. The grade Jersey herd continues to do well. Six cows completed lactation periods during the year and gave a mean yield of 650 gallons for the 300 day lactation period. The animals appeared in no way distressed by shade temperatures up to 105°F.

Native type steers grazing lucerne and lucerne-grass pastures, made live weight gains of between 1 and 1.5 lb. per day. Carcase quality of those slaughtered was good.

The back-crossing of Wiltshire x Persian x native sheep to the Wiltshire x Persian stock was continued, the aim being to produce a type with the heat tolerance of the native and the better carcase quality of the exotic stock. Lambing has been satisfactory. Twin lambs are not uncommon, and one set of triplets has been produced.

11. GATOOMA RESEARCH STATION

A. H. McKINSTRY

OFFICER-IN-CHARGE

Rainfall. There are three raingauges at the Station and they are situated spatially on the apices of a triangle, and separated from each other by distances which vary approximately from 1.50 to 1.75 miles.

Rainfall totals at the three gauges for the period October, 1956, to April, 1957, were: at the Laboratory, the official gauge of the Meteorological Department, 26.62 inches; at Bagley gauge 24.69 inches; and at West End gauge 22.32 inches. The majority of the experimental plots and fields were situated in the areas receiving either approximately 26.50 inches or 22.25 inches of rainfall. The distribution was good, except that there was no rain during the latter half of March.

The total rainfall of 26.62 inches, recorded from October to April inclusive, at the Laboratory gauge, in 1956-57, compares with totals registered in the two immediately preceding seasons, for the same period, of 47.46 inches in 1955-56, and 37.72 inches in 1954-55. The two previous seasons were, therefore, appreciably "wetter".

Because of the lower rainfall total and good distribution in 1956-57, and the bed and furrow system of surface drainage, established by ploughing in recent seasons, the amount of water-logging which occurred in the comparatively flat lands of the Station was negligible. Climatically the season was favourable for the growth of cotton.

Further details of rainfall and also of sunshine are given in the following table. For comparison the previous season's rainfall and sunshine are shown in brackets. The low average daily sunshine hours for November and December, 1956, are noteworthy.

TABLE I

RAINFALL AND SUNSHINE RECORDS; OCTOBER 1956 TO APRIL, 1957, INCLUSIVE
(Figures in brackets are for 1955–56)

Period	Total Rainfall (inches)	Rainless days	Longest Period without Rain	Average Sunshine (hrs. per day)
October 1956 .	0·54 (0·27)	27	26	9·9 (8·4)
November 1956 .	4·30 (4·25)	14	6	4·8 (8·2)
December 1956 .	6·08 (10·41)	14	4	5·5 (6·2)
January 1957 .	6·99 (2·39)	22	9	7·5 (6·6)
February 1957 .	4·88 (17·13)	12	4	7·3 (6·2)
March 1957 . .	2·95 (9·79)	20	18	8·3 (6·6)
April 1957 . .	0·88 (3·22)	28	18	9·5 (6·9)

COTTON PLANT BREEDING

Yield. In contrast to other sections of this report, in which cotton yields are given in terms of lb. seed cotton per acre, yields derived from the plant breeding plots and trials will in future be expressed in terms of lb. lint per acre. To convert seed cotton to lint the appropriate ginning outturns of different varieties and strains are applied and, by this means, strains are directly comparable on the basis of the yield of lint per acre. As an approximation lb. lint × 3 = lb. seed cotton.

Insecticide. As planned, all plant breeding plots and trials received nine or more applications of Endrin, in order to provide a large measure of control of insect pests so that as much as possible of the yield-potential of different strains might be realized, in so far as climatic and soil factors permit. By applying insecticidal treatment, it is hoped that comparison of the intrinsic yields of different strains will be possible. The high level of yields obtained, and reported later, reflect the success of applying Endrin treatment in 1956-57.

However, as cotton growers do not yet apply insecticide to their crops generally, selected strains, in the later stages of the breeding programme, will also be grown, in bulk plots, without insecticidal treatment, starting in 1957-58. The two areas, one with and the other without insecticide treatment, are separated from each other by approximately 1.5 miles.

Bacterial Blight. With regard to Bacterial Blight resistance, as in the previous season 1955-56, infection of plant breeding material was again induced artificially by soaking the seed in a suspension of *Xanthomonas malvacearum* before planting, and subsequently, by spraying the foliage of plants with a suspension of the organism at approximately 45 and 75 days after germination. In addition, in 1956-57, two techniques, developed at the Central Cotton Research Station, Namulonge, Uganda, whereby a suspension of the bacteria is introduced into the boll wall were tried. Of the two techniques, a needle-prick method, by which the bacteria are introduced into the boll wall with a needle designed for the purpose, gave better results than a brush method, by which the organism is introduced into the calyx cup by means of a small camel-hair brush.

Applying the foregoing methods to the appropriate material, all cotton seedlings which showed symptoms of the disease at thinning were removed. Furthermore, roguing of diseased plants was carried out two weeks after spraying. And finally, selection of plants for resistance to the disease, in the remaining populations, was based on the degree of development of bacterial lesions in inoculated bolls.

Starting in 1957-58 the Branch of Botany and Plant Pathology, Salisbury, has undertaken to be responsible for supplies of the necessary bacterial culture.

Sabi Station. The plant breeding programme at the Sabi Valley Station has been extended to the full range of trials. It is proposed to breed cottons for the lowveld, irrigation conditions at Sabi, and for the higher-veld, rainfall conditions at Gatooma, for a number of generations, to determine if two separate plant breeding programmes are necessary.

Cotton Selection and Crosses — Bacterial Blight. Selections for resistance to the disease were made in the same stocks as in the previous seasons, namely:—

1. Progenies of crosses between BAR 4/18 *G. barbadense* and *G. hirsutum* varieties.
2. Progenies of Albar 51.
3. Progenies of crosses between selections from Albar 51 and Albar 49 with strains derived from MU8A × BP52[2]. In the interests of brevity this material will, in future, be designated BMA strains.

The number of selections made from the above lines, the seed lint indices and halo lint length analyses of the selections, and the types of plant breeding plots and trials in which the selections will be planted in 1957-58 are described in the Plant Breeder's section of the full report. In addition, certain lines of BP52, which carry the resistant B_2B_6m genes, were received from the Sudan, and these were crossed with MU8A and a number of Albars.

Descendant of U4. No further selections were made in 9L34 modal bulks as it is likely that this variety will be replaced by G52/36 in commercial cultivation. G52/36 is a 1952 selection from 9L34. Therefore, single plants were selected for analyses from G52/36. An account of this work is given in the full report.

Cotton Trials. The following is a summary of the main yield results obtained in different variety/strain trials at Gatooma and at Sabi:—

TABLE 2

Name of Station and Trial	*Yields in lb. clean LINT per acre*		
	Mean for Trial	*Highest Yield*	*Yield 9L34*
At Gatooma:			
Replicated Progeny I — U4 Strains	213	316	206
Replicated Progeny II — MU8A × BP52 Strains	318	493	388
Small Bulks	396	447	416
District Variety	385	400	382
Preliminary Variety	378	490	291
At Sabi:			
Replicated Progeny I — U4 Strains	655	864	599
Small Bulks	813	940	725
District Variety	895	988	896

Insect pests control by application of Endrin contributed largely to the high yields of lint per acre at both Stations. The comparatively lower yields in the Replicated Progeny Trial I at Gatooma were possibly due to poorer soil conditions.

Multiplication of G52/36. As arranged previously, seed of G52/36 was multiplied, at a spacing of 3.5′ × 1.5′ (2 plants), in approximately 15 acres under irrigation at Humani Ranch in the Sabi Valley, and in five acres under rainfall conditions at the Gatooma Station.

The yield at Humani Ranch was only 430 lb. seed cotton per acre, a most disappointing result, due mainly to unforeseen circumstances connected with land levelling and the application of irrigation water.

In marked contrast, the yield at Gatooma was 1,170 lb. seed cotton per acre and of this quantity only seven per cent. was classified as stained cotton. This result probably approaches nearly the upper limit of yield for rain-grown cotton under Rhodesian conditions.

To reduce loss from insect pests attack, as far as possible, the Humani Ranch crop was treated with DDT/BHC cotton dust, kindly paid for by the Rhodesia Cotton Growers' Association. Similarly the Station's crop received 13 applications of 0.25 lb. Endrin per acre. In both instances the insecticides were applied by hand-operated dusters or sprayers as appropriate.

The cost of the Endrin alone, applied at Gatooma, was nearly £8 per acre; nevertheless, including this and other expenses connected with the crop, it is estimated that the nett profit was within the limits of £15 to £20 per acre.

The ginning outturn of G52/36 is about 1 to 1.5 per cent. higher than 9L34, the present commercial variety.

Again, moderately large-scale spinning tests, kindly conducted by the Cotton Industries Board, indicate that G52/36 and 9L34 are about equal in yarn properties. Furthermore, it is considered that G52/36 is an improvement on 9L34 in plant uniformity and jassid resistance.

After consideration of all relevant factors, it has been decided to issue to growers the 4,700 lb. of acid-delinted, water-sinking seed of G52/36, which is available, for further multiplication, mainly in the Lonely Mine (Bulawayo), Gatooma-Hartley and Sabi areas of the country with smaller acreages in the Umtali, Fort Victoria and Gwelo districts. It is estimated that the total acreage to be planted to G52/36 in 1957-58 will be approximately 385 acres.

Growers have been advised that G52/36 is an improvement on 9L34 in plant uniformity, ginning percentage and jassid resistance; and that yield and spinning performance of the two strains are similar.

Growers are also constantly reminded that the greater part of the high yield potential, for which cotton strains are bred at Gatooma, will not be realized unless recommended agricultural practices are carried out, and unless the crop is protected with insecticide.

It is not yet clearly evident which strain or variety of cotton will supersede G52/36, but Albar 637, a variety with good yield, high bacterial blight resistance, good ginning outturn and lint quality is being further tested. The jassid resistance of Albar 637 is in question. Therefore, particular attention will be given to observing the resistance of Albar 637 to jassid when the variety is grown as a bulk in the unsprayed area of the Station in 1957-58.

COTTON INSECT PESTS CONTROL

Investigations on cotton insect pests and methods for their control were conducted by Mr. J. P. Tunstall, leader of the Team of Entomologists, recently appointed to work on cotton pests in Rhodesia and Nyasaland, and by Mr. D. J. W. Rose, seconded temporarily, from the Branch of Entomology, Salisbury. In point of fact Mr. Rose arrived at the Station in September, 1956, and initiated much of the experimental work on insect pests. He was joined by Mr. Tunstall in February, 1957. Mr. Rose returned to Salisbury at the end of August, 1957.

Previous work on cotton pests at Gatooma, conducted largely by professional staff without specialist entomological training, since the Station started in 1925, has produced evidence from which a picture of the incidence and habits of the important pests can be traced in fair detail, in relation to the development of the cotton crop, as well as to certain other food plants of the different pests.

More recently, for about five seasons, experiments with insecticides have been conducted. The results of these experiments, more particularly in the 1954-55 and 1955-56 seasons, have shown clearly that yields of seed cotton per acre can be increased by applications of Endrin. However, until 1956-57 there was little detailed information on the effect of the insecticides applied on pest populations, particularly that of Red Bollworm *(Diparopsis castanea)*, which is the main pest of rain-grown cotton in Southern Rhodesia.

In 1956-57 at Gatooma there were two main areas of cotton, separated by a distance of approximately 1.5 miles, under investigation. The larger area of about 20 acres, divided between fields H-C and BA, contained the plant breeding plots and bulks, and the agronomy trials, all of which were treated with 9-13 applications of 0.25 lb. Endrin in 10-12 gallons of water per acre. Also in this area were two insecticide trials, one of them situated within and the other sited adjacent to the area as a whole. In the smaller area, in field WEE1, 1.5 miles distant from the sprayed cotton, there were seven acres of cotton none of which was sprayed at any time during the season.

It is with the yield results and the detailed records connected with crop development and insect pest populations in the unsprayed area, and in the two insecticide trials, that this abridged report is mainly concerned. A summary is also given of an insecticide trial conducted with irrigated cotton at the Sabi Valley Station. All relevant information has been extracted from the full report of the Entomologists, which also contains the results of other investigations on the biology of Red Bollworm.

Climatically, the 1956-57 season was favourable to cotton. In all fields at the Station plant growth was good, and yields, generally, were also good.

Records in the Unsprayed Area. An assessment was made of crop production and loss and insect pests populations in one acre of cotton situated within the seven acre field of unsprayed cotton already referred to.

Losses due to pests, but principally Red Bollworm occurred at every stage of growth of the cotton plants. For example, before and at the earliest stage of flower bud production, larvae were found boring in stems via tips and axillary buds. The damage caused, probably, reduced the rate of plant development and the total number of sympodial nodes (fruiting points) produced. Also, the total percentage of the recovered buds shed due to bollworm was 74 per cent. for the season, and, of 12 green bolls shed per plant, 56 per cent. were damaged by bollworm.

Furthermore, while approximately 12 bolls per plant came to maturity and opened, six of these or 50 per cent. were damaged only by bollworm. An analysis of the seed cotton contained

in all mature bolls revealed that, due to bollworm alone, 13 per cent. of the cotton was stained and 26 per cent. was completely damaged so that it was unpickable.

Gatooma Insecticides Trial I. There were six treatments in this trial; in three of these Endrin was used as a spray; in two other treatments eight weekly applications of 10-12 lb. per acre of 10 per cent. DDT + 3 per cent. gamma BHC dust were made, starting at first buds; and the sixth treatment was "control" in which no insecticide was applied.

The three Endrin treatments gave significantly higher yields of seed cotton per acre than control or the dust treatments. There were, however, no significant differences between the three Endrin treatments, in all of which 0.25 lb. active ingredient in ten gallons of water per acre was applied as follows:—

(a) Eight application at weekly intervals from first flower buds.

(b) Eight applications at weekly intervals from first bolls.

(c) Eight applications over a period of 12 weeks from first buds.

Though not significant, eight weekly applications of Endrin from first bolls gave the highest yield at 835 lb. seed cotton per acre.

Mean yields in the trial, in lb. seed cotton per acre, were, approximately:—for the three Endrin treatments 795 lb., for control 310 lb. and for the DDT/BHC dust 445 lb. Stained cotton amounted to 16 per cent. in the control plots and varied between 10 and 20 per cent. for the other treatments.

Gatooma Insecticide Trial II. The trial was designed to determine whether greater protection from insect pests could be obtained by increasing the amount of Endrin applied or by increasing the volume of water.

The trial was arranged in a field of cotton which had already received five weekly applications of 0.25 lb. Endrin in ten gallons of water per acre, from first buds. The final yield from this treatment was approximately 1,150 lb. seed cotton per acre. This was significantly less than each of three other treatments which all received a total of 13 weekly applications of Endrin. Variations among the 13 application treatments were 0.25 lb. Endrin in ten gallons water, 0.25 lb. Endrin in 20 gallons water and 0.50 lb. Endrin in 20 gallons of water per acre. The mean yield of these three treatments, between which there was no statistical significance, was 1,685 lb. seed cotton per acre.

The appreciably higher level of yields in Trial II as compared with Trial I may have been due to the fact that all plots and the surrounding area of Trial II were sprayed with Endrin, whereas Trial I contained untreated as well as low-yielding dusted plots, and comparatively, this trial was also more isolated from the bulk of the sprayed area.

Certain records in Trial I showed that there was interaction between *Diparopsis* egg laying and treatments. In brief, the more effective the treatment, the greater the production of fruiting points, and the higher the number of eggs oviposited.

In both trials yield increases were due to the fact that Endrin controlled *Diparopsis* which was the pest of greatest importance.

Endrin applications affected crop production in the following ways:—

(i) There was a significant increase in both the rate and number of sympodial nodes (i.e. fruiting points) produced. The control of *Diparopsis* larvae boring into the terminal growing points and stems at an early stage of plant growth may account for this, although a direct effect of Endrin on the plant itself cannot be overlooked.

(ii) There was a high degree of protection afforded to flower buds and shedding due to bollworm was considerably reduced. Flowering was increased.

(iii) Although the loss of smaller green bolls to bollworm was reduced the protection given at this stage was not as marked as for flower buds.

(iv) The amount of damage to large bolls, as judged by the amount of staining and by the destruction of seed cotton of bolls attacked by bollworm, was not appreciably reduced by Endrin applied at eight weekly intervals from first buds. However, treatments applied over a later period of plant growth gave some protection.

From a consideration of the yield results, and of the records on bollworm and crop production, it would seem that weekly applications of 0.25 lb. Endrin in ten gallons of water per acre should be started soon after the appearance of first flower buds and continued for at least eight consecutive weeks and probably a few weeks longer, other factors being favourable to crop production. Growers are being advised accordingly.

Cotton Bulks and Endrin Treatment. Endrin was applied, at the rate of 0.25 lb. in ten gallons of water per acre to cotton bulks in the same field, within which Trial II was situated, with the following results:—

(a) Following on nine applications of Endrin, Strain 9L34, spaced 3.5′ × 9″ yielded 1,000 lb. seed cotton per acre of which seven per cent. was stained, from 2.75 acres.

(b) Following on 13 applications of Endrin, Strain G52/36, spaced 3.5′ × 18″ (2 plants) yielded 1,170 lb. seed cotton per acre, of which seven per cent. was stained, from 4.75 acres.

For comparison with the two sprayed bulks, within the obvious limitations of such comparisons, 7.50 acres of 9L34, spaced 3.5′ × 9″, in the "unsprayed area" yielded 700 lb. seed cotton per acre, of which 13 per cent. was stained.

Farm Scale Insecticide Plots. In an attempt to obtain a more definite assessment of the value of the Endrin treatment 4-acre plots will be planted on 12 farms in the Gatooma-Hartley districts in 1957-58. Six of the plots will be sprayed with Endrin, while the remaining six will not receive insecticide. Records of crop production and loss and of insect pests populations will be taken throughout the season. The insecticide and part of the equipment for the project has been kindly donated by The Rhodesia Cotton Growers' Association.

Sabi Valley Station Insecticide Trial. In this trial, 0.25 lb. per acre Endrin was applied in 15 or 45 gallons of water, at seven or 14 day intervals, while 0.125 lb. per acre Endrin was applied in 15 or 45 gallons of water but only at the seven day interval. Also, 12-15 lb. per acre DDT/BHC dust was applied at both seven and 14 day intervals. There were also control plots which received no insecticide. Thus there was a total of nine treatments. In all instances a total of ten applications was made at the seven day interval and of five applications at the 14 day interval, all starting at first buds.

It was not possible to take records of crop production and loss, but certain records of pests populations indicated that *Diparopsis* and *D. fasciatus* were the most numerous pests, although numbers were generally low.

The main result of the experiment was that the yield of the control plots, namely 1,304 lb. seed cotton per acre was significantly less than the highest yield of 2,236 lb. seed cotton per acre obtained by making ten applications of 0.25 lb. Endrin per acre in 15 gallons water at seven day intervals, from first buds. Other results were:—

Endrin treatments were generally more effective than the DDT/BHC dust in increasing yields.

The dust gave significantly better yields than control at the seven day interval but not at the 14 day interval.

Increasing the volume of water in which the Endrin is carried from 15 to 45 gallons appeared to have no effect on yield.

Reducing the amount of Endrin from 0.25 lb. to 0.125 lb. per acre resulted in a small reduction of yield which may be justified by a reduction in the cost per acre of the insecticide.

Increasing the interval between applications from seven to 14 days, thereby halving the total number of applications, resulted in a considerable reduction of yield.

All insecticide treatments reduced staining considerably.

Sabi Valley Observation Plots. Six one-acre cotton plots were grown under irrigation and treated with eight weekly applications of DDT/BHC dust, at different projects, directed by the Department of African Agriculture in the Sabi. Where agricultural treatment was satisfactory yields were of the order of 1,500 to 1,800 lb. of seed cotton per acre. It is probable that there will be an increase in the number of growers at the Devuli project in 1957-58.

Sabi Tanganda Estate. In the 1956-57 season, 19 acres of cotton grown under irrigation gave an average yield of 1,500 lb. seed cotton per acre. From seven of the 19 acres, where plant stands were considered satisfactory, the yield was 2,000 lb. seed cotton per acre and probably more. The cotton was remarkably free of staining.

The cotton was sprayed by hand-operated knapsack sprayers, a total of only four times with 0.50 lb. Endrin at approximately 14 day intervals. It is likely that approximately 350 acres of cotton will be planted on the Estate in 1957-58, and that the crop will be sprayed with Endrin.

AGRONOMY

Cotton — Crop Loss Trial. Summarized details of this trial are placed under the agronomy section because it formed part of the Agronomist's research programme but, as it happened, the results obtained are concerned mainly with cotton insect pests.

The trial was designed to assess, as far as possible, the relative importance of different forms of crop loss due to bacterial blight, to bollworms, to stainers and to other unknown causes. For the purpose, different plots of Albar 637, a variety resistant to the bacterial disease, and of A5851, a susceptible variety, were treated or not treated, according to design, with the insecticide Endrin, with Agrimycin, and with a suspension of the bacterial blight organism. The Agrimycin treatment was an attempt, albeit unsuccessful, to control bacterial blight.

Records on bacterial blight infections were taken on the seedlings at thinning, and, throughout the course of the season, flower bud and boll sheds, and later, split bolls were examined for symptoms of the disease, and also for damage caused by bollworm, stainers, and other causes.

The main yield results from the trial were that the mean yield of Albar 637 treated with Endrin was 1,580 lb. seed cotton per acre, compared with a mean of 795 lb. seed cotton per acre from the untreated plots of the same variety. By contrast, the A5851 Endrin-treated and untreated plots gave mean yields of 857 lb. and 439 lb. seed cotton per acre respectively. Differences between these yield results are all statistically significant, except in the comparison between Albar 637 unsprayed and A5851 sprayed.

Again, the mean percentages of stained cotton in the Endrin-treated and untreated Albar 637 plots was of the order of 2.5 and 10.5 per cent. respectively, while the corresponding figures for stained cotton in A5851 plots were 6.25 and 20 per cent.

The foregoing figures for yield and staining together with results from a wide range of records and observations, published in the full report of the Station, support the following main conclusions from the trial.

(1) Insect pests damage, predominantly bollworms, and more particularly Red Bollworm, caused very much greater losses in the crop than did bacterial blight. Losses were made up of the shedding of buds and green bolls directly caused by bollworm feeding, and of staining or discolouration of the seed cotton of mature bolls by organisms which gained entry as a result of bollworm damage. In fact, bollworm accounted for just over 50 per cent. of all flower bud and green bolls which were shed, compared with three per cent. due to bacterial blight.

Furthermore, 38 per cent. of the total number of split or mature bolls were damaged by bollworm, 16 per cent. being totally destroyed. In contrast, 11 per cent. of the split bolls showed bacterial blight lesions, only two per cent. being totally destroyed. The majority of split bolls damaged by bacterial blight were derived from the susceptible A5851, and not from the resistant Albar 637.

(2) As shown in a previous paragraph, Endrin insecticide applications, which in the trial numbered 12 × 0.25 lb Endrin, increased yields in both Albar 637 and in A5851 by approximately 100 per cent., the general level of yields being appreciably and significantly higher in the case of Albar 637. The insecticide treatment also led to a reduction in the amount of stained cotton, the reduction being approximately two-thirds.

(3) The crop in the Endrin-treated plots ripened earlier and more evenly than that in the unsprayed plots.

(4) Paradoxically, green boll sheds, due to causes other than bollworm, cotton stained, and bacterial blight were appreciably higher wherever the insecticide was applied. This result would seem to indicate that yields of seed cotton per acre greater than 1,600 lb. from Albar 637 and 800 lb. from A5851 were not attainable under the prevailing soil, climatic, and other allied conditions of the season. Nevertheless, no doubt it will be conceded that a yield of 1,600 lb. seed cotton per acre from rain-grown cotton in Southern Rhodesia even if its production was assisted by fairly liberal applications of Endrin cannot easily be equalled.

(5) Because of the failure of Agrimycin to control bacterial blight effectively, no comparisons are possible between yields in the presence and absence of the disease; but it is noteworthy that the total numbers of bud and boll sheds, exhibiting blight lesions, which were collected over a period of four months, from 120 feet of row length, were considerably lower at one bud and six bolls for the resistant Albar 637, compared with 16 buds and 177 bolls for the susceptible A5851.

Although different analyses in the Crop Loss Trial have given factual evidence in support of previous observations and contentions that bollworms are very predominantly the cause of crop loss, and that comparatively, bacterial blight disease is definitely of less importance, it has been decided to terminate the trial. The reasons for the decision are that varietal resistance to the disease is attainable, that certain insecticides will effect a large measure of control of cotton insect pests, and that the considerable labour involved in conducting and analysing a cotton Crop Loss Trial is required for other research work.

Acknowledgement is here made of the fact that the main treatments in the Crop Loss Trial were suggested by Mr. E. O. Pearson of the Commonwealth Institute of Entomology, on his visit to the Station in 1956.

Gatooma Fertilizer/Spacing Trial. The separate spacing and fertilizer trials conducted in the 1955-56 season were terminated and in their place the following fertilizer and spacing treatments were combined in a 3^4 factorial trial, planted to the variety 9L34, in the red soil at the Station.

TABLE 3

	Levels of Nutrients lb./acre		
N in sulphate of ammonia	0	20	40
P_2O_5 in superphosphate	0	30	60
K_2O in muriate of potash	0	30	60
Spacing between plants in the row	6 ins.	12 ins.	18 ins.

The spacing between rows in all instances was 3·5 feet.

The trial received nine weekly applications of 0.25 lb. Endrin in 10-12 gallons of water per acre, commencing at first buds. This treatment undoubtedly contributed to the control of insect

pests, which in turn was reflected in the high-level mean yield from the whole trial of 1,030 lb. seed cotton per acre and the low percentage staining (from all causes) of 10.6 per cent. in the trial.

The main yield results from the trial were that there was a slight but non-significant response to nitrogen, and that the yield increases due to applications of both phosphate and potash were significant, especially so with potash. However, there were no worthwhile differences between K_1 and K_2 or between P_1 and P_2 applications.

Furthermore, of the three spacings, 6″ between plants in the row produced the highest mean yield of 1,125 lb. seed cotton per acre, which was statistically significant over both the 12″ and 18″ spacings. There was also a significant difference between the two latter treatments.

The interaction between nitrogen and the other three factors was significant, more clearly was this so with phosphate. Without phosphate there was no beneficial response to nitrogen and, in the absence of nitrogen, application of phosphate gave no response.

Examination of all relevant yield results indicates that, under similar conditions, a suitable combination of spacing and fertilizer treatments would be one of 6″ between plants in the row with an application of 30 lb. per acre of P_2O_5, and of K_2O, and of 20 lb. N per acre at planting.

During the season, counts of fruiting points on plants in different treatments revealed that the principal factor influencing the number of fruiting points produced was spacing. Thus, although a greater number of fruiting points per plant were present at the wider spacing, i.e., 116 fruiting points at 18″ as against 54 fruiting points at 6″, there were more fruiting points per unit area at the closer spacing, i.e., 309 fruiting points at 6″ compared with 221 fruiting points at 18″, per ten square feet.

Mondoro Fertilizer/Spacing Trial. This trial, planted to 9L34, was grown in sandy soil derived from granite, in the Mondoro Reserve, approximately 60 miles distant from Gatooma.

Treatments, arranged in a 3 inch factorial design, were as follows:—

TABLE 4

	Level of Nutrients lb./acre		
N at planting in sulphate of ammonia	0	20	40
N at top dressing in sulphate of ammonia	0	20	40
P_2O_5 in superphosphate	0	40	80
K_2O in muriate of potash	0	30	60
Spacing between plants in row	6 ins.	12 ins.	18 ins.

The spacing between rows was uniformly 3·5 feet.

The trial received eight weekly applications of 0.25 lb. Endrin in 10-12 gallons of water per acre, starting at first buds. In spite of the insecticidal treatment staining of the seed cotton was unexpectedly high, the overall percentage being 45 per cent. The reasons for this result are not obvious; the distance of the trial from Gatooma precluded close observation on insect pests attack and damage, and other factors during the season.

Compared with a similar trial at Gatooma which received nine applications of Endrin and which yielded 1,030 lb. seed cotton per acre with little stained cotton, the mean yield of the Mondoro trial was 510 lb. seed cotton per acre.

The main significant yield responses in the trial were that N exceeded N_0 and P_1 exceeded P_0, but differences between N_1 and N_2 and between P_1 and P_2 were not significant. Furthermore, no significant differences were obtained from the potash applications nor, surprisingly, between the different spacings.

The results of the trial indicate that the best combination of treatments for cotton in the sandy granite-derived soil in Mondoro would be 40 lb. N, 40 lb. P_2O_5 with possibly some potash, say 20 lb. K_2O, and a spacing of approximately six inches between plants in the row.

Crops other than Cotton — Maize Stubble Mulch Trial. This experiment, which was started in 1955-56, and which it is planned to run for several seasons, is designed to assess the effect of stubble mulching, trash ploughed under, and trash removed prior to ploughing (clean ploughing) on yield, and on the incidence of *Helminthosporium*, various cob rots, and maize stalk borer.

Each of the three cultivation treatments received applications of 0 lb., 200 lb., and 400 lb. sulphate of ammonia per acre, half of the fertilizer being applied at planting and half when the maize was knee-high.

Grain yields in terms of bags (200 lb.) per acre for the two seasons are given in the following table:—

TABLE 5

Treatments		Grain Yield as Bags per Acre 1955–56	1956–57
Clean	N_0	9·9	5·2
	N_1	15·6	12·0
	N_2	18·4	16·7
Means		14·6	11·3
Trash	N_0	8·0	4·6
	N_1	12·6	11·0
	N_2	16·3	14·9
Means		12·3	10·2
Stubble	N_0	6·2	4·6
	N_1	12·6	10·5
	N_2	12·6	13·9
Means		10·5	9·7

Statistical analyses of the 1956-57 yield results show that the Clean plots were better than either Trash or Stubble plots and that Stubble treatment was also inferior in yield to Trash ploughed under. Moreover, a greater response was obtained from applications of sulphate of ammonia than from the cultivation treatments. Thus N_2 applications were significantly greater than N_1, and N_1 than N_0.

Comparing yields in the two seasons, those of 1956-57 were lower than in 1955-56, and differences due to cultural treatments were also less in 1956-57, although the order of the three treatments was the same.

Analyses of the *grain* from 200 cobs taken from treatments, for disease and insect damage revealed that there were no significant differences, in 1956-57, between treatments in respect of undamaged grain, or grain damaged by stalk borer, by borer plus *Fusarium maniliforme*, or by other insects.

With *Diplodia zeae*, however, there was significantly more of the disease in N_0 than N_1 and in N_1 than N_2. There was also more *Diplodia* in the Stubble than in either the Clean or the Trash plots, but between the Clean and Trash plots there were no worthwhile differences due to Diplodia.

Other results of the trial are published in the full report. Also the analyses of *cobs* for disease and for insect damage are for report by the Seed Analyst and by the Entomological Branch respectively.

The very light incidence of *Helminthosporium* in 1956-57 did not warrant observations being taken, to assess possible differences.

Legumes. Pigeon Pea seed of as many varieties and strains as possible was obtained from different countries including Africa, India, Australia, North America and the British West Indies.

There are several well-defined types among the two-hundred-or-so plots planted in 1956-57, and these are being observed for the following possible main uses: leguminous green crop, hay, browse or graze, silage, meal, and for human consumption. Several of the varieties may have a number of uses.

Frost tolerance and improved palatability, if obtainable, would make the crop a most valuable one for grazing or browsing during the winter and hot weather months when the feed value of natural veld is usually at a very low plane. Up to the present the crop has been free of disease and only light infestations of aphid have been noticed.

Of 18 strains of Crotalaria those of *C. usaramoensis, C. striata* and *C. intermedia* showed a certain amount of promise as leguminous green crops.

Canavalia ensiformis, the Jack or Sword Bean, planted at three different dates, suffered crippling damage by the cowpea beetle *(Ootheca mutabilis)* in the earlier plantings, and by a virus disease in the last planting.

Co-operative Crop Trials. The trials listed below were planted, maintained and harvested at Gatooma, for professional officers who are responsible for the main work on different crops at other Stations, as will be indicated. The trials are conducted at Gatooma mainly to increase the range of crops which may be suitable for the rainfall areas typified by the Gatooma-Hartley area, and to provide the officers responsible with relevant information for this purpose.

It is very necessary that varietal and other trials for all crops, should be grown in as many likely ecological areas as possible, irrespective of whether the trials have to be placed in Reserves,

on farms, or at Stations other than that at which the main work on a given crop is being conducted.

Details of the arrangement of the trials and of the yield results obtained are reported on by the officers concerned. In 1956-57, the trials were:—

1. Maize Variety Trial for Salisbury Experiment Station.
2. Maize Population/Spacing Trial for Salisbury Experiment Station.
3. Wheat Spacing/Seed Rate/Weeding Trial for Salisbury Experiment Station.
4. Sorghum Varieties planted in isolated Observation Plots for Matopos Research Station.

12. CHEMISTRY BRANCH

Dr. B. S. ELLIS

Chief Agricultural Chemist

The past year's figures reflect a steady consolidation in the activities of the Branch, with some contraction in the amount of general and routine work and a significant increase in research activities. The soil testing section, which during the year moved into its new laboratory, increased its output, although the number of samples sent in by farmers remained at about the previous level.

The Branch was short of staff throughout the year—a position which seems at last about to be corrected—and the soil survey section virtually ceased to function as an entity after July. This was due to a combination of factors of which the most important was the departure, on a six months F. A. O. Fellowship in America, of the head of the soil survey section, Mr. J. G. Thompson. The only other trained experienced pedologist, Mr. du Toit, was seconded to Conservation and Extension for pedological work inseparable from Farm Planning. With no one properly to train the new recruits in the field, those officers assigned to soil survey, after one field trip, were dispersed throughout the other short staffed sections, particularly soil testing, to ensure that our most pressing and immediate responsibilities were discharged with as little upset as possible. With Mr. Thompson's return the soil survey section will be re-united and will at once adopt a vigorous programme. Pedology is basic to agriculture, and the high reputation which we enjoy among world scientists must be maintained.

Apart from the Soil Survey Section, the one probably most affected by resignations and by delays in filling vacancies was the General Section. There was little serious delay or decline in most essential activities except that sampling of fertilizers and farm feeds under the Act could and should be much more thoroughly carried out. With the limited staff all was done that was humanly possible, but the only means of having effective control over these materials is by frequent official sampling. A move was made by the R.N.F.U. during the year to bring Farm Feeds under a Bureau of Standards type of control, and many meetings were held with the trade, who themselves are anxious to preserve the highest standards. In terms of the Act official control must remain with this Branch, but a Committee to lay down specifications, and the testing of such ingredients as vitamins and antibiotics, would undoubtedly result in improved feeds. The matter is still being actively discussed.

The research programme is dealt with in its appropriate section. It is sufficient to mention here that we have at last been able to make a start on the problems of minor or trace element nutrition, a possibility which has been hopefully noted in previous annual reports.

Among the activities not covered under the respective sections must be classed the various committees, which take up a considerable amount of the time of senior members of the staff. An addition to the list, not noted before, is the Committee for the Kafue Flats Pilot Polder. This enterprise has the most important implications and possibilities for the Federation. The Chief Agricultural Chemist, or his deputy, is the only Ministerial representative, and makes, we hope, a significant contribution.

Another activity is our collaboration with the Soil Conservation Service of America on the preparation of a new international system of soil classification: many of our soils did not readily fit into the categories laid down, and we have helped to ensure that they do, and have even been instrumental, or partly instrumental, in bringing about some major changes. We are also of course a constituent member of the Council of the Inter-African Pedological Service and are slowly building towards a soils map of Africa.

An important activity, stressed last year, continues unabated. This is the holding of classes for officers of the Department of Conservation and Extension and of the Native Department, as well as of our own Department, in soils. In such courses the Chemistry Branch gives all the lectures and demonstrations necessary for the minimum understanding of the soil factors most important in assessing capability classes for farm planning. It must be emphasized again that such short courses enable field officers who are not pedologists to recognize those soil characteristics which we have selected as being most important in land use. The combination of these soil factors with slope and erosion largely determines the behaviour of the soil under cultivation

and dictates its use. The courses can never train field officers as pedologists: pedologists are specialists. It is therefore essential that all soil work, other than for detailed farm planning, must as before be directly controlled by this Branch: the soil work for farm planning is controlled indirectly through our seconded pedologists. In this way we can maintain the high standards we have achieved and ensure their uniformity over the whole country.

While on the subject of pedology I may add that I attended the annual S.A.R.C.C.U.S. meeting which was held this year in Windhoek and spoke to a resolution on a subject which we had been pushing for some time, that is the need for a regional conference of pedologists to achieve uniformity within the region as a step to achieving continental accord. This was accepted and the Conference will take place next year. At the recent inter-African soils meeting at Yangambi, this regional approach was held up as a shining example to the rest of Africa.

We have worked in the closest accord with research stations, other Branches, other Departments, other Ministries and in fact with other Governments. If our co-operation with the Tobacco Research Board is not as close yet as we might wish, it is nevertheless very much greater than in the past. We endeavour that our very detailed knowledge of soils and of soil fertility may be made available to all branches of agricultural science, whatever their administration.

GENERAL SECTION

The following table gives a classification of the samples analysed and reported upon by the Section during 1956-57:—

Manures and Fertilizers	104
Farm Feeds	77
Vegetable Products	172
Limes and Limestones	5
Waters	31
Toxicological	427
Dips	22
Meats	22
Oils	36
Miscellaneous	84
TOTAL	980

The total of 980 samples for 1956-57 was by 239 samples below the figure for 1955-56 which amounted to 1,219 (not including soil samples). While this is essentially due to a decrease in the number of certain classes of samples submitted, a larger number of official samples of fertilizers and farm feeds could have been taken and analysed if the staff position had been more favourable: of the three officers constituting the Section (including the Senior Officer i/c) one had to spend a very large proportion of his time on administrative work until this was taken over by the new General and Administrative Branch at the Station, and the other junior member of the staff was rather inexperienced as an analyst.

Apart from the analytical work the Section also supplied 156 Winchester Quarts of Standardized iodine solution for dip testing to the Veterinary Department; 10 Winchester Quarts of standardized sodium hydroxide solution to the Dairy Branch, and two Winchester Quarts of standard acid to a private firm. Approximately 150 interviews were given to farmers and others.

Manures and Fertilizers. The total number of samples reported under this heading was practically the same as in the previous year (101). While guanos formed the largest section in this group in the preceding years, approximately 60 per cent. of the samples reported in this group for the year 1956-57 were ordinary inorganic fertilizers, about 20 per cent. organic commercial fertilizers (guanos and others); and the remaining 20 per cent. composts and farm manures. Eighteen samples of commercial fertilizers were analysed under the Act.

Farm Feeds. This group shows a considerable decrease against the preceding year (203). Approximately half of these samples were analysed for stockfeed manufacturers prior to registration, and 35 of the samples were analysed under the Act.

Vegetable Products. With a total (172) slightly exceeding last year's (164) this group includes 81 wheat samples from variety trials at the Salisbury Agricultural Experiment Station analysed for protein, 23 samples of maize, mostly from experimental plots, nine hays, 15 silages, 20 samples of tobacco (partly from fertilizer trials, partly from manufacturers) and ten samples of apple leaves from Inyanga tested for mineral deficiencies. Other samples reported under this head were those of oranges, ground-nuts, lucerne, and other fodder plants.

Limes and Limestones. Only five limes and limestones were submitted for analysis, one of which was examined for a firm as to its suitability as an ingredient of stockfeeds.

Waters. Apart from water samples submitted by farmers and others and tested for their suitability for irrigation, the number (31) includes some waters analysed for the Hydrological Engineer and for industrial firms as well as some water analyses carried out for the Veterinary Department in connection with disease problems in livestock.

Toxicological. Most of the samples (427) in this category were submitted by the Veterinary Department (post mortem specimens of animals, feeds, excreta and other materials) in connection

with suspected poisoning. Tests on 251 of the samples, i.e. nearly 60 per cent. of the total, were positive, most of them in respect of arsenic.

Dips. Of the 22 dips tested, 17 were arsenical dips, the remainder consisting of 3 BHC, 1 toxaphene and 1 DDT dip.

Meats. 22 samples of meat were analysed for the Chief Animal Husbandry Officer for protein, fat, ash and moisture.

Oils. The number (36) of oil samples submitted for analysis has shown a marked increase in the past few years. During the year under review, 22 samples of ground-nut oil produced by a local firm for export and 14 samples of neatsfoot oil from the Cold Storage Commission of Southern Rhodesia were examined.

Miscellaneous. This heterogeneous group includes a variety of samples, amongst others, 18 samples of blood, 12 samples of butter, 6 samples of cheese, 10 samples of oxgall, and 5 samples of boneash.

SOIL TESTING SECTION

The new Soil-Testing Laboratory was completed in April, except for the connection of electrical power which was still not available at the end of the year under review. Immediate advantage was taken of the greatly improved facilities for receiving and preparing samples, but practically no use could be made of the laboratories, and throughout the busy season work has been carried on under the unsuitable and over-crowded conditions of the past. The anticipated increase in efficiency and output has therefore not been realized, and the inevitable backlog developed at the peak period. Fortunately, however, it was not as serious as last year, because the receipt of samples was more evenly distributed over the winter months, and it was possible to clear it completely by the 30th September.

The number of samples upon which reports have been issued shows a marked increase over last year (3,508 compared with 2,706), although the actual number of samples received is little different. Part of the increase is accounted for by the backlog carried over from the previous year, and part by the inclusion in this year's total of samples from field trials and Research Stations analysed for the Research Section during the winter months when few samples are received from farmers.

The following analysis of the nature and origin of samples reflects the preponderance of tobacco soils submitted and the comparatively small use made of the soil-testing service by farmers in the northern territories. In the latter connection it is interesting to note that more than half of the samples from Northern Rhodesia were submitted by a representative of one of the larger fertilizer companies.

	Southern Rhodesia	Northern Rhodesia	Nyasaland	Outside Federation	Total
Tobacco:					
Flue-cured	1,397	40	—	33	1,470
Turkish	30	1	—	—	31
Seedbeds	33	2	—	—	35
Maize	560	300	—	3	863
Potatoes	26	7	—	—	33
Other Field Crops	105	18	—	2	125
Pastures	54	5	—	1	60
Lucerne	32	7	—	—	39
Market Garden Crops	100	15	—	—	115
Orchards	13	1	—	—	14
Private Gardens	197	2	—	1	200
Sports Clubs and Schools	46	—	—	—	46
Investigatory:					
Research Section	302	—	—	—	302
Soil Survey	2	—	—	—	2
Other Government Depts.	58	—	4	—	62
General Public	7	—	—	—	7
Miscellaneous	103	1	—	—	104
	3,065	399	4	40	3,508

RESEARCH SECTION

Research activity continues to be concentrated on soil fertility and pastures but the projects under investigation cover a wider scope than previously. The immediate problems involved in the assessment, and correction, of the major nutrient supplying power of our soil are now much better understood and greater interest therefore attaches to problems of minor element nutrition and more fundamental aspects of soil fertility.

A considerable volume of analytical work was again carried out by a very small staff, to whom great credit is due for their sustained effort. The high output was nevertheless only achieved with the aid of "temporary" workers, university students working in their vacation, or other staff available for research for only limited periods, with the result that it has not been possible to maintain adequate continuity of work in each problem. Although a considerable mass of data

has been accumulated, therefore, a great deal of it still requires critical evaluation and much of it should be prepared for publication. Two papers, on the estimation of available phosphorus and nitrogen, were, however, published in international soil science journals during the year.

The work carried out during the year may be classified under the following headings:—

Criteria for assessment of fertility status and for making fertilzer recommendations.

As in previous years as much data as possible was obtained from field trials carried out in different parts of the country by research stations, the Department of Conservation and Extension, the Native Department, and such bodies as the Tobacco Research Board. Some samples were received from as far afield as the non-Native Tobacco Research Board at Iringa, Tanganyika. The number of samples received from these sources is shown in the table. The majority of research station samples were from Grasslands, Salisbury, Gwebi and Matopos, in that order. Comparatively few were submitted from Sabi, Gatooma and none from Henderson.

These field trial samples were mostly analysed by routine procedures in the soil testing section during the "slack" period. This analytical data was correlated with the field crop data in the research section and was used to refine the criteria used for advisory purposes, which were again completely revised before the commencement of the main testing season.

Particularly interesting results were obtained in experiments at Grasslands and at Salisbury where the harmful effects that may follow soil acidification resulting from the use of heavy dressings of sulphate of ammonia were illustrated. These effects were shown to be due to aluminium toxicity, in the case of the Grasslands sandy soil, and to manganese toxicity in the case of Salisbury red soil.

A considerable amount of data continues to be obtained from the green manure trial at Salisbury, and critical evaluation of this together with a review of the future analytical programme is now required. A feature of the trial is the very large response to phosphate obtained on this old reverted land, by comparison with that obtained elsewhere on the station where residual fertilizer phosphate is high. As a result it is proposed to initiate some new phosphate experiments on similar land this coming season.

Pasture Research. The number of samples submitted from pasture experiments on research stations was much the same as last year, but it has been possible to eliminate the backlog of samples, and consequent delay in reporting results, which accumulated then.

The analytical work on the 1956-57 digestibility trials carried out at Henderson, which involved a larger programme than in previous years, has been completed. The results are being prepared for publication by Mr. Elliott in association with this branch. Results both in indoor trials on feedstuffs and in the field in grazing investigations were satisfactory, but it is felt that greater precision in experimental and analytical techniques will be required in more critical work on animal nutrition in the future.

Investigations into the occurrence of "phalaris staggers" in sheep and cattle folded on Rompha grass at Grasslands were carried out and have shown that the condition can be delayed, or prevented, by heavy dosing with cobalt either in the lick or applied as fertilizer to the Rompha. Analysis of the grass and comparison with the fescue and clover from adjoining plots failed to show any significant difference in cobalt or copper contents that would account for the disease. These results are similar to those obtained in Australia where phalaris staggers has also been reported, and it appears likely that the trouble may be associated with a specific toxin in the Rompha.

Soil Fertility Studies. Work has continued on the series of experiments started last year with a view to obtaining information on nitrogen release from soils ploughed out of grass. Grass swards, both virgin and cultivated, have been turned in at different times and stages of maturity and sampled periodically for assessment of nitrogen status both by incubation techniques and by means of pot experiments using a dwarf cereal as test crop. This work should provide valuable data on the extent of microbial fixation and release of nitrogen under the different conditions. The results last season showed a good correlation between crop removal of nitrogen in pots and release of nitrogen on incubation, suggesting that despite the sieving of samples prior to incubation only small corrections are required for the organic matter removed. The pot trials for this season are now under way.

Further studies on soil phosphate have been made. An examination of the phosphate fixing power of a number of typical soils at different pH's was carried out. The shape of the curves obtained was much the same for all soils, showing a marked increase with increasing acidity, but the different soils had widely differing fixing powers. The use of anion-exchange resins for estimating phosphate availability was studied; technical difficulties were encountered in the procedure but these have now been mastered and it appears to offer considerable promise. Further investigations have been planned to confirm this.

The distribution of phosphate and potash between top- and sub-soils on a number of different soil types in different areas has been studied and the results are of interest. In general, available phosphate decreases rapidly with depth and the main source of plant-available phosphate is thus in the plough layer. The same is true of exchangeable potash in most heavy textured soils derived from basic igneous rock, so that evaluation of the nutrient status of the soil from a plough-

layer sample is valid. With sands, however, the exchangeable potash often does not greatly decrease, and may even increase, with depth, particularly when the texture increases with depth as in many granite sands. Under these circumstances sub-soil potash is obviously of importance and its evaluation from the surface soil only is no longer valid for deep rooted crops. An adequate potash status in the surface soil will of course be reflected by lack of response in the field, but an inadequate potash status at the surface will not necessarily indicate a deficiency unless the sub-soil is also poorly supplied.

Problems of minor element nutrition have formed a considerable part of the research programme. Of these the problem of toxicities encountered on soils of the Great Dyke has been pursued with a view to being able to predict from soil data where they will be encountered. This is of obvious value to farmers considering opening new land in these areas. The occurrence of nickel and chromium toxicities on these soils has been confirmed by means of both analytical and pot culture techniques. It has been found possible to predict the occurrence of nickel toxicities from a determination of the exchangeable nickel in the soil, but similar success has not been obtained with chromium, the available forms of which in the soil have not yet been evaluated. Work on this problem is still in progress; in advisory work interpretations are tentatively based on total chromium contents.

Preliminary work has been started on a survey of the status of the nutritionally important trace-elements in Rhodesian soils. Analyses of a number of different soils for molybdenum and boron have been completed, but further work is proposed on the other important nutrients on both soil and plant samples. Considerable trouble has been experienced with analytical techniques for estimation of boron and none of the methods tried has proved satisfactory, but preliminary work on an original conductimetric procedure is showing promise. For the further work it is proposed to employ spectrographic procedures to enable a number of elements to be determined simultaneously.

Some work has been done on methods of assessing soils for possible manganese toxicities, a problem which is complicated by the rapid change in exchangeable manganese—apparently the important fraction from the point of view of toxicities—on drying and storage of samples. Incubating the soils prior to determination of exchangeable manganese has shown some promise but much further work is required.

A number of plant samples have been analysed for farmers and for research stations in attempts to diagnose nutritional troubles and in most cases valuable indications have been obtained. There is an increasing demand for this service and there appears little doubt that an advisory plant analysis laboratory run in conjunction with the soil analysis laboratory would be well supported. It would seem, however, to be desirable to establish that nutritional disorders of plants and animals are sufficiently widespread, or will become economically important with intensification of agriculture, to justify the cost of establishment of such a laboratory. In the meanwhile it is only possible to accept a limited number of samples, as far as possible selecting cases which are of economic importance or are of general interest and likely to provide data to supplement that obtained from research projects.

Nutrient Uptake of Tobacco. This work has been continued during the 1956-57 season, and a number of samples of leaves, stalks, tops and suckers were taken from plots at Mr. Huddy's farm Russeldene and Mr. Hinde's farm Eyrecourt. The nitrogen and phosphorus determinations on these as well as on last year's samples have been completed. The average nitrogen and phosphorus uptake for both seasons for a yield of 1,500 lb. per acre of cured leaf is given, as follows:—

lb. N		lb. P_2O_5	
1955–56	1956–57	1955–56	1956–57
45·7	52·1	11·8	16·1

A feature of interest is that the phosphorus uptake was considerably higher on plots where the phosphate had been applied both by banding and broadcasting than where it had been banded only (namely 19.7 as against 12.6 lb. P_2O_5/1,500 lb. cured leaf yield).

Analytical work on these samples is being continued.

Research Samples Analysed 1956-57

Pasture Research—	
Pasture Samples	1,250
Digestibility Trials	319
Lysimeters	101
Phalaris Staggers Investigations	9
Miscellaneous	14
Field Trial Samples—	
From Experiment Stations	285
From Department of Conservation and Extension	23
From Native Department, Tobacco Research Board, etc.	34
Soil Fertility Studies—	
Nitrogen Availability	267
Phosphate Studies	110
Distribution P and K in top and sub-soils	92
Minor Elements:	
Survey and Methodology	121
Dyke Toxicities	87
Miscellaneous	48
Miscellaneous Studies	6
Nutrient Uptake of Tobacco	22
TOTAL	2,788

SOIL SURVEY SECTION

The field activities of the section have been drastically curtailed and ultimately brought virtually to a standstill by lack of trained staff. The year began with two pedologists in the section. Early in 1957 three more chemists were appointed and their field-training was begun. In June, however, Mr. du Toit was seconded to the Department of Conservation and Extension to give pedological guidance in the soil classification and land-capability assessments which are fundamental to the farm-planning surveys of that Department, and also to assist in the elementary pedological training of its field officers. Shortly afterwards the Senior Officer, Mr. Thompson, left for the United States on a five month F.A.O. study followship. Since this left no trained pedologists, field work ceased, except for a few minor investigations which were undertaken by senior officers of other sections. Close collaboration with the senior farm-planning officers of Conservation and Extension in the continued development and refinement of criteria for assessment of land-capability has, however, been maintained by the former officer in charge of Soil Survey who has also assisted in the lectures on this subject which form part of the Farm-Planning Courses. The mutual benefit obtained from this type of collaboration between professional officers of Departments concerned with different aspects of the same problem has again been gratifyingly demonstrated.

Before the cessation of field work at the end of June several soil reconnaisances had been undertaken. Just before the commencement of the rains in 1956 a brief, urgent investigation was made for the Southern Rhodesia Native Department of proposed irrigation schemes in the extreme south and south-east of the country. This was followed immediately by another urgent reconnaisance, an assessment for the Southern Rhodesia Irrigation Department of the irrigability of the land on the Triangle Sugar Estate that would be commanded by a proposed high-level canal; the broad distribution of the soils most suitable for irrigation was mapped and their extent measured.

At the same time a preliminary reconnaisance was made of the nearby Hippo Valley Scheme, and this was followed in the 1957 field season by more detailed work in which irrigable soils were broadly classified and mapped.

Early in 1957 the Senior Officer assisted a chemist of the Tobacco Research Board and an officer of the Department of Conservation and Extension in an investigation into the correct siting of a proposed Tobacco Research Station in Northern Rhodesia.

Eight minor field investigations have been made. These include: inspection of a farm proposed for a Research Station on the fine-grained sands of the Charter District; investigation of fertility problems on two irrigation schemes near Salisbury; reconnaisance with an engineer of the Hydrological Branch to select a suitable site for a Hydrological Research Station west of Que Que; and investigation of drainage problems for the Town Planning Office.

Visits have been paid by the Senior Officer to the Gatooma Research Station with the Committee on High Watertables, and to Livingstone and the Lomagundi area with Committees investigating land-use problems.

During the year a paper entitled "Granite soils in Southern Rhodesia" was published in the Rhodesia Agricultural Journal by Mr. J. G. Thompson. Based on work carried out at various times when opportunity served, this paper is of particular interest because it represents a considerable advance in our knowledge, and is the first serious attempt to define the considerable and significant, but hitherto vaguely recognized, soil varieties in what is loosely called "granite sandveld", and also to suggest the pedogenetic processes responsible for them.

PUBLICATIONS

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13. ENTOMOLOGY BRANCH

J. A. WHELLAN

CHIEF ENTOMOLOGIST

Introduction. The year has been one of steady progress in the work of the Branch. This has largely been due to the filling of all vacancies for professional staff, some of which have lain vacant for nearly two years. Dr. C. E. Taylor joined the staff as Senior Entomologist at the end of January. He was just preceded by Mr. G. C. Martin in the newly created post of Senior Helminthologist. At the end of the year the remaining post of entomologist was filled by Mr. H. D. Brown. The Branch has given more help than ever previously to the Grain Marketing Board in tackling its special problems. Dr. Taylor was loaned to the Board from July to September and was largely responsible for placing the Board's pest control programme on a sound scientific basis. In September he was joined by Mr. Rose who was preparing to take over from him. For the whole of the earlier part of the year Mr. Rose had been seconded to the Gatooma Research Station where he inaugurated the research on methods of control of cotton pests. Mr. J. Tunstall joined this Station in February to take full control of the scheme—a joint project between the Federal and Nyasaland Governments and the Colonial Office—assisted by Mr. Sweeney in Nyasaland, but by the end of the year it had still not been possible to obtain the services of a third entomologist to complete this research team as envisaged, and to that extent the work of the team was being hampered. This research team is not under the direct control of the Branch but there is, naturally, close liaison and a measure of guidance is given. The work of the Branch was again materially helped by the temporary employment of two university students during their long vacation.

There were no serious outbreaks of pests though the range of the Khapra beetle continued to extend and it was found as far east as Umtali and north to Shamva.

In phytosanitary matters it has been a source of disappointment that little real progress has been made towards securing unitary legislation throughout the Federation. The difficulties are entirely legal and political, but towards the end of the year there seemed hope that the new bill would be presented to Parliament in 1958.

The International Red Locust Control Service has again had a good year and the outlook for 1958 is very promising. An empirical means of forecasting Red Locust populations in the outbreak areas, based on meteorological data, has been evolved and the indications are that populations will remain low in 1958. The Chief Entomologist visited the Rukwa outbreak area during the wet season and was able to examine the first Swamp Skipper in action under the difficult conditions then prevailing. Delivery of further models has been delayed, but another development of great interest is the ram-jet helicopter which may be even more suitable for the conditions than is the Swamp Skipper. The Service is attempting to reduce its established staff and has suggested a scheme of temporary help in time of need on the part of contributing governments. This has not been favourably received in the Federation which is all the more regrettable as the headquarters of the Service are sited in the Federation.

The African Migratory Locust Control Organization has again had a satisfactory year. Financial considerations prevented the Federation from being directly represented at its annual meeting, held at Kara in French West Africa, for the first time since its inception.

International Meetings. The Chief Entomologist represented the Federation at the first meeting of the Interafrican Phytosanitary Commission held in London in November, at the C.S.A. Specialist meeting on stored food products held in Salisbury in January, at the Southern African Regional Phytosanitary Meeting held in Pretoria in April and at the Council Meeting of the International Red Locust Control Service held at Dar-es-Salaam in July.

Research. Due to the complete absence of occurrence of army worm it was not possible to continue the work on this insect. An important point was cleared up, however. A few eggs were obtained and the resulting larvae were reared at Salisbury under as natural conditions as

possible. This establishes that it would be possible, given an adequate food supply, for the insect to develop on the Rhodesian plateau throughout the year.

A severe outbreak of maize ladybird occurred, especially centred in the Norton area, at the beginning of the growing season. Trials showed it to be unexpectedly difficult to control with the commonly used insecticides though malathion, endrin and dieldrin all proved effective. A study of its life-cycle was made, and a bulletin giving as much information as possible was published in time for the next growing season.

An investigation into the habits of cutworms was carried out. Though more than one species is known to be involved all that were bred proved to be *Agrotis segetis*. Whether different species attack plants above or below ground level, or whether all spend some time below ground level and how far down they go, are important points which need clarifying in order to ascertain the best methods of applying insecticides for their control. There is a growing desire to apply insecticides with fertilizers for the obvious reason that it enables two operations to be carried out in one but whether this would be a satisfactory method against cutworms is quite uncertain at present.

The investigation of the detailed life-cycle of the maize stemborer is being continued. No success has been obtained in attempts to rear this species from Napier fodder. It seems that the earlier record may have been based on erroneous reasoning. The larvae found there may merely have entered the Napier fodder stem to hibernate and may not have fed there at all. It has been observed that full-grown larvae wander and enter various holes to hibernate. This point still needs further investigation, however, since it is of great significance in the relationship between Napier fodder and irrigated maize grown in proximity.

An investigation of the aphid distribution in the Federation with particular reference to their significance in the transmission of virus diseases of potato has been commenced. The possible importance of hemipterous insects in affecting seed production in various crops is also under investigation.

With the appointment of a helminthologist, detailed work on nematodes has become possible for the first time in the history of the branch. The field is a vast and almost untouched one so that, for the present, the apparently most important economic group, the root-knot nematodes, is being studied. Preliminary work on these, which is at present being undertaken, involves as complete a study as possible of the host range and distribution of the known species. In the course of this survey it became apparent that one of the species *Meloidogyne hapla*, was associated with imported fruit trees far more often than would have been expected by chance. A fourth species, *M. arenaria*, has been discovered in the Federation in addition to the previously known species *M. javanica*, *M. hapla* and *M. incognita var. acrita*. A long term experiment has been laid down designed to test the longevity of the common root-knot nematode, *M. javanica* under different soil conditions and in the absence of host plants and pure cultures of three of the four species have been established in order to test the susceptibility to them of various economic plants.

Stored Product Insects. Extensions of range of the Khapra beetle as far as Shamva and Umtali have been detected during the year. This insect is thus now known in practically all areas where grain is stored. While some heavy infestations have occurred, the better understanding of pest control measures brought about by the seconding of entomologists to the Grain Marketing Board has resulted in a marked improvement in general. This has largely been due to the close attention to detail which has been carried out when fumigating grain and applying insecticides. There is, however, a long way to go yet as the processes in use at present are troublesome to carry out, expensive and require a considerable number of men to work them. A C.S.A. specialist meeting on stored food products was held in Salisbury in January. As it happened the time and place were very appropriate and the exchange of views which took place is likely to prove most valuable.

In the course of an overseas visit the Chief Entomologist examined fumigation systems in use in England and Australia both for grain and tobacco fumigation. So far no definite steps have been taken to provide facilities for tobacco fumigation in the Federation. There is, however, a growing interest in this matter on the part of the tobacco trade and there is no doubt that such facilities would be valuable.

Occurrence of Insect Pests. There were no major outbreaks of pests during the year, the most serious, probably, being of the maize ladybird previously referred to, while earlier in the season cutworms were very prevalent. The number of inquiries on citrus psylla and helopeltis bug continues to increase and this suggests that these pests are becoming increasingly troublesome, especially in suburban areas. The clouded yellow butterfly was very numerous in many lucerne crops, extensive damage being recorded to several of them. It was generally brought under control by the virus disease which always seems to develop when the caterpillars become numerous. Unfortunately this, of course, is after the damage has been done. The virus has been extracted and trials are being made to ascertain if the larvae can be infected at an early stage which would thereby prevent heavy infestations from developing. The American bollworm was found, together with other lepidopterous larvae, damaging heads on a castor bean crop in the Fort Victoria area. A heavy infestation of earwigs in beehives at Gwebi was found. They are honey-robbers but do not usually occur in such large numbers.

Advisory Service. Altogether 355 inquiries were recorded at the Branch—a smaller number than in most recent years. This is probably due to the increasing part played by Conservation

Officers and the Tobacco Research Board in answering routine inquiries. It is noticeable that most of the inquiries now concern less usual pests, well-known ones such as maize stem-borer and cutworms comparatively rarely being the subject of inquiry.

With the increase in staff it was possible to make more advisory visits. The practice of recording these has, however, been discontinued since it is no longer possible to separate them from visits made for survey or research purposes. Extended tours included three to the Eastern Districts, one to the Fort Victoria area, and one to Chirundu and the Lusaka area, while the opportunity was taken by the Chief Entomologist of investigating the eelworm position in the Abercorn area during his visit there. Henderson, Grasslands, Sabi and Gatooma Research Stations and Gwebi College were all visited several times and liaison with the appropriate departments of the University College has been maintained. The usual course of eight lectures was given to students at Gwebi Agricultural College and talks to a number of farmers' meetings were given on various insect problems. Exhibits stressing the importance of maize stem-borer and root-knot eelworms were staged at the Salisbury and Bulawayo Shows.

Publications. The following articles have been published:—

(a) in the *Rhodesia Agricultural Journal.*

The work of the Entomological Branch of the Department of Research and Specialist Services, by J. A. Whellan.

Report of the Chief Entomologist for the year ending 30th September, 1955, by J. A. Whellan.

Four Kinds of Root-knot Nematode, by G. C. Martin.

The Recent Outbreak of Ladybird on Maize in Southern Rhodesia, by C. N. Smithers.

(b) In the *Proceedings of the Second Annual Conference of the Professional Officers of the Department of Research and Specialist Services.*

Recent Observations on Maize Pests, by J. A. Whellan.

(c) In *Rhodesian Tobacco.*

Insect Control in Farm Buildings, by J. A. Whellan.

(d) in *Proceedings of the Royal Entomological Society.*

Three new species of Myopsocidae, by C. N. Smithers.

(e) In *Entomologists' Monthly Magazine.*

The male of *Ectopscopsis mazambicus*, by C. N. Smithers.

More popular notes and reports of interviews have appeared in the local press, the Rhodesian Farmer, the Farmer's Weekly and the Rhodesian Tobacco Journal.

Visiting Scientists. The following entomologists and other scientists visited the Branch.

Mr. J. Bowden, Entomologist, Accra, Gold Coast.

Sir Frank Engledow, Drapers Professor of Agriculture, University of Cambridge.

Dr. D. L. Gunn, Director, International Red Locust Control Service, Abercorn.

Mr. R. W. Jack, former Chief Entomologist, Salisbury.

Dr. J. Risbec, Scientific Secretary for Inter-African Phytosanitary Commission.

Dr. E. W. Russell, of E.A.A.F.R.O., Kenya.

Dr. Bernard Smit, Senior Entomologist, Division of Entomology, Pretoria.

Mr. L. D. E. F. Vesey-Fitzgerald, Principal Scientific Officer, International Red Locust Control Service, Abercorn.

Mr. W. Wilson-Jones, of Colonial Pesticides Research Committee, London.

Phytosanitary Services. The first meeting of the Inter-African Phytosanitary Commission, held in London, in November, 1956, was attended by the Chief Entomologist. The second meeting, also in London, was held in September, 1957, and was attended by the Chief Botanist and Plant Pathologist. Both the Chief Entomologist and the Chief Botanist and Plant Pathologist attended the meeting of the Southern African regional group held in Pretoria in April, 1957. In the course of his African tour, the Scientific Secretary of the Inter-African Phytosanitary Commission spent a few days in Salisbury in March, 1957. The result of these several meetings has been that a much better understanding of the problems has been gained by the territories concerned. Several of these have had no phytosanitary safeguards previously, so that they would well act as avenues for entry of previously excluded pests into Africa. The prevention of such introductions is one of the main tasks of the Commission. At the Pretoria meeting stress was laid on the importance of maintaining our freedom from Colorado beetle and Japanese beetle.

Progress with the new Federal phytosanitary legislation was slower than had been hoped but, by the end of the year, the first draft of the bill had been received from the law officers. The several dependent regulations are almost ready for publication once the bill has passed into law.

The presence of a third Plant Inspector at Bulawayo proved not to be justified since the bulk of fruit travelling direct to Gwelo was far less than had been anticipated. He was therefore transferred to Umtali where a more effective plant inspection service had long been required.

Special permits for the import of plants totalled 851 and annual permits for the import of their stock were issued to 57 nurseries in the Union of South Africa. Interceptions of various prohibited items were made—the largest numbers being in respect of tomato and citrus fruits, banana leaves and dahlia tubers. One consignment of apples was heavily infested with codling moth and was destroyed. Five consignments of water hyacinths were destroyed in terms of the Noxious Weeds Act.

Registered nurseries in Southern Rhodesia numbered 48. Most of these were inspected during the year and it was not necessary to quarantine any. Certificates of cleanliness were issued in respect of 221 consignments for export.

The number of Tobacco Removal Licences issued increased from 3,558 to 4,014; in addition there were in Northern Rhodesia 395 premises where inspections were carried out. The total number of inspections made rose from 4,211 to 4,443; all European premises were inspected at least once. There are in addition 612 African owned premises in Southern Rhodesia which are not at present subject to inspection. Because of the greater danger of their harbouring stored tobacco pests, town premises were frequently inspected.

Two inspections were made of railway storage sheds at Beira. Some old and damaged tobacco was found to be infested and was destroyed. Generally, however, the attention to cleanliness and spraying at Beira has been excellent.

There were two occurrences of cigarette beetle in tobacco delivered from farms, once to a grading shed and once to an auction floor; there were 14 other occurrences of this pest in grading sheds, warehouses and sample rooms. Three of these were in Lusaka, Gwelo and Darwendale and the remaining 11 in Salisbury. In all cases the pest was destroyed before any movement of tobacco took place.

A sample of tobacco imported from India was found to be infested with cigarette beetle and was destroyed. Eight successful prosecutions were made for contravention of the Tobacco Pest Prevention Regulations.

14. BRANCH OF BOTANY, PLANT PATHOLOGY AND SEED TESTING

DR. G. R. BATES

CHIEF BOTANIST AND PLANT PATHOLOGIST

INTRODUCTION

The staff position was improved by the appointment of Mr. J. B. Phipps in November to the post of Grass Taxonomist in the Botany Section and by the appointment of Mr. H. C. Ducker as Gardens Superintendent during the same month. Dr. H. Wild continued his secondment in London on the Flora Zambesiaca project.

Dr. G. R. Bates and Mr. G. W. Herd both went on leave during the year and whilst overseas undertook official duties on behalf of the Department.

Considerable interest has been aroused in agricultural and horticultural circles by the initial success obtained from the growing of high quality seed crops in the Federation. Commencing with the production of pasture grass seed, this new industry has rapidly expanded, and now embraces the more specialized production of certain flower seeds in addition to vegetable seed. Much of the success attending these developments must be ascribed to the willingness of growers to organize themselves into Seed Producers' Associations, and to follow the fairly strict rules prescribed by such bodies to ensure crops of the necessary quality and uniformity required by the trade.

Equally important developments took place in seed potato production where, following a prolonged trial period in the Eastern Districts, growers in the Salisbury area also decided to establish an Association aimed at improving the standard and quality of the locally produced article. During the year under review the two schemes were merged into a National Seed Potato Association. A great deal of technical assistance was provided by this Branch in drafting suitable rules and regulations covering the production of certified seeds and seed potatoes. Furthermore, the services of its professional officers were again made available for the many field inspections and laboratory tests required. It is gratifying to note the continued progress of these new ventures which now show clear signs of becoming permanently established within the general framework of the Federation's agricultural industry.

By far the greater part of the work involved in these developments has fallen to the Seed Testing Section, which has also been faced with a steadily increasing volume of samples for analysis.

Improvements are being made to the Seed Testing Laboratory to alleviate congestion, and to provide better conditions for the large scale testing of seeds. It is regrettable, however, to have to report yet again that no success has attended our continued efforts to overcome the chronic congestion in Botany and Plant Pathology, or to obtain better buildings to house these two sections.

Investigations were continued on several important disease problems affecting maize, potato and legume crops. Further attention was also given to certain important diseases affecting deciduous fruits and vegetables. In such activities we have, as always, enjoyed the valued co-operation and assistance of the Research Stations and of the Department of Conservation and Extension.

The amount of travelling done by officers of the Branch increased considerably due to heavier demands for inspection services and specialist advisory visits. The Branch contributed exhibits to the Bulawayo and Salisbury Agricultural Shows and to a Horticultural Trade Show held in Salisbury. At the last named Show our stand attracted numerous interested people and the officers in attendance were literally inundated with inquiries. The usual course of Plant Pathology Lectures was given at the Gwebi College of Agriculture, along with lectures on Seed Legislation, Testing and Production. Numerous talks were given to Farmers' Associations and to other bodies concerned with agriculture and horticulture in many parts of the Federation.

Two articles were published in the *Rhodesia Agricultural Journal*, and two in overseas journals. Other articles, notes and reviews were contributed to the "Rhodesian Farmer" and to the local press.

BOTANY

Herbarium. The number of accessions made during the period under review rose sharply to more than 10,000, comprising more than 6,700 for identification, and some 3,200 named duplicates from other Herbaria. More than 80,000 specimens are now housed in the Herbarium, which represents an increase of 14 per cent. over the previous year.

3,201 plants were named for Federal and Territorial Government Departments and other public bodies.

Increasing use is being made of the Herbarium facilities by the two Northern Territories. It is also noticeable that many collectors are supplying more specialized material in the knowledge that this will be of particular value to Flora Zambesiaca workers.

Collections of more than usual interest were received from Mr. E. A. Robinson, Mr. N. C. Chase, Mrs. Noak, Dr. W. Gilges and Messrs. Newman & Whitmore of the 1956 Cambridge University Mlanje Expedition.

Special mention must also be made of the large and beautifully prepared collections which Mr. Chase continues to send from the Eastern Districts, and of the very useful material supplied by Mr. Robinson from Northern Rhodesia. We are also indebted to Major O. B. Miller for his prolific collections, mainly from Matabeleland.

The interchange of specimens with other Herbaria in all parts of the world continued on an intensive scale. Material of selected genera of families was dispatched to various specialists, in addition to the regular collections forwarded to London for use in connection with the Flora Zambesiaca.

Mr. R. B. Drummond accompanied the Rhodesian Schools Exploration Society Expedition to the Makarikari Pan, Bechuanaland, in April and May and made an important collection of some 200 specimens. Other collecting expeditions were made to the Lower Sabi and to the Chimanimani.

Work on the Flora Zambesiaca has made excellent progress despite the complicated organizational arrangements. It is now anticipated that Volume 1 will be published in two parts, the first of which should be ready for the press by the middle of 1958, and the second about a year later. Some 300 species have already been completely written up for Volume 1, representing about half of the total likely to be included in this volume. The script and illustrations of eight families has been completed; work is well advanced on two other families, and will shortly be commenced on two more.

Dr. N. Robson was appointed to the project in December, 1956, when he joined Dr. Wild at Kew. It is hoped to recruit one further Botanist to the staff to work with Mr. A. W. Exell at the British Museum.

New species and new combinations for the Flora are being published with the general title "New and Little Known Species from the Flora Zambesiaca Area". Three papers, two by Dr. Wild, and the other by Mr. A. W. Exell, bearing this title were published during the period under review.

Many visitors were welcomed to the Herbarium to discuss botanical problems and to work through our collections. Despite ill-health, Mr. F. C. Greatex continued to give valuable assistance by naming all the orchid material received.

Economic Botany. Numerous instances of suspected plant poisoning in animals and humans were investigated on behalf of the Police, the Government Analyst, and the Veterinary Department.

Urginea burkeana was implicated in the veld poisoning of sheep at Mazoe, and *Datura stramonium* and *Lantana camara* with the death of cattle in the Bulawayo and Salisbury districts respectively.

Castor Bean seeds were identified in connection with a fatal case of poisoning of an African.

Identifications and advice were supplied to several Medical Practitioners on the poisonous properties of various plants, including ornamental shrubs.

More requests from pharmaceutical firms for information and assistance in obtaining plants possessing useful medicinal properties were dealt with. Many of these inquiries concerned the distribution and ecology of *Dioscorea sylvatica* in the Federation. A specimen of *Cannabis sativa* was identified for the Police, and technical advice provided to the Ministry of Health in connection with new legislation concerning this dangerous drug plant. Numerous plants used in native herbal remedies were named for Dr. M. Gelfand and others interested in this subject. A wide range of indigenous fruits used by Africans was named for Mr. Carr of the Nutrition Council who is examining the nutritive value, and especially the ascorbic acid content, of such fruits.

Determinations and advice on the potential value of indigenous legume and grasses for pastures and green manures were supplied to farmers and agricultural officers from other departments. Increased use was made of our identification services by the Government Helminthologist in connection with his nematode survey and by entomologists studying aphids. Numerous plants of ecological importance were named for the Department of Conservation and Extension. Host plants were also named for Mr. N. Krauss of Honolulu who visited the Federation in the course of his investigations on the biological control of *Emex, Myrica* and *Lantana* in Hawaii.

The need for a specialist officer to deal with weed problems on a more intensive and practical scale than is at present possible is becoming increasingly evident. Whilst it is possible to cope with the general run of inquiries regarding the identification and control of weeds in agricultural crops and gardens, the numerous range of materials now becoming available for their chemical control requires an extensive programme of field trials if their performance and value under local conditions is to be properly assessed.

Reasonably satisfactory control was maintained over the most serious water hyacinth infestations located at Lake McIlwaine and in the Hunyani and Makabusi rivers. The delayed delivery of bulk supplies of 2, 4-D amine weed killer resulted in a temporary spread of the weed during August and September. One new infestation was confirmed near Umvuma, the weed being present in an old irrigation furrow running through a large vlei. This infestation appears to be some years old, but has been prevented from spreading by a dense growth of reeds and grass along the margins of the furrow. All known infestations of water hyacinth were periodically inspected and sprayed in the course of the year. Those in the Tsungwesi and Odzi I.C.A. Districts still represent a threat to the Sabi River should abnormal flooding occur at any time.

National Botanic Gardens. The appointment of a Garden Superintendent and the provision of additional funds enabled more development work to be done than has been the case for several years. All fences were put in order, some old roads and tracks were closed, and a new access road constructed to the Water Works Reservoir. Extensive clearing of exotics, chiefly Eucalypts and *Cedrella toona* was undertaken, and practically the entire area of the gardens protected by carefully laid out contours. New extensions to the Water Works reserve occasioned by the phenomenal growth of Salisbury have meant a re-casting of our original plans for developing the hilly section of the area. Further work in developing Alexandra Park as a Botanic Garden is handicapped by lack of funds for essential buildings.

PLANT PATHOLOGY

Advisory. Exceptionally wet and overcast weather conditions prevailed throughout the Colony during November and December, 1956, and were accompanied by unseasonal outbreaks of disease in several crops, notably tobacco and potatoes. Subsequently, less extreme weather conditions were experienced and the general run of summer crop diseases showed few outstanding features.

Various factors including weather conditions, are responsible for the fluctuations which occur in the numbers of diseased specimens sent in for examination. In contrast with the previous year there were substantial reductions in the number of maize, potato and legume crop specimens although considerably more tomato and castor bean material was submitted. Altogether 614 specimens were dealt with and included 34 new host or disease records of which the following justify special mention:—

Late blight of *Datura stramonium* due to *Phytophthora infestans* (Mont.) de Bary; leaf spot and grey mould of castor bean due respectively to *Alternaria ricini* (Yoshi) Hansford and *Sclerotium ricini* Godfrey (*Botrytis* stage only); stem canker of cabbage due to *Phoma lingam* (Tode ex. Fr.) Desm.; leaf spot of eggplant (brinjal) due to *Cercospora solani-melogenae* Chupp; leaf spot of chilli due to *Cercospora cinamonoi* Castellani; leaf spot of chicory due to *Cercospora chichorii-intybi* Wor.; and leaf spots of dolichos bean and mung bean both due to *Ascochyta phaseolorum* Sacc.

Two other records of more than usual interest were of *Phoma* sp. and *Cercospora* sp. both attacking the maize witchweed parasite *Striga asiatica.*

Tobacco. The first epiphytotic of tobacco anthracnose (*Colletotrichum tabacum*) developed throughout the main flue-cured tobacco growing areas of the Colony during November and December, 1956. Seedbed plantings were chiefly affected but the disease also attacked older plants in the field causing considerable losses. The first records of tobacco anthracnose on Turkish tobacco were obtained in January, 1957, when the disease was widely reported in seedbeds, some of which were totally destroyed.

Wildfire and angular spot were also troublesome during December and January but were checked by subsequent dry spells. Seedling injury caused by excessive alkalinity and the incorrect use of insecticides was more prevalent than usual. On the other hand, surprisingly few specimens of tobacco rosette, mosaic, white mould and barn rot were received.

The incidence of frog-eye and *Alternaria* showed little change over the previous year and once again no serious losses from these leaf-spotting diseases were reported. Leaf blotch of seedlings due to *Septomyxa affinis* was noted for the second successive season whilst one case of hollow stalk of flue-cured tobacco caused by *Bacterium carotovorum* occurred at Nyabira.

Potato. Extended spells of wet, overcast weather occurred from mid-November onwards, providing favourable conditions for the early development of late blight in susceptible varieties. The disease was first observed on 25th November amongst a time of planting trial with Up-to-Date potatoes at the Henderson Research Station. This was fully four weeks earlier than any previous record of the disease amongst summer crops in Mashonaland. Blight appeared almost simultaneously in early planted commercial crops of the same variety although nearby plantings of Kennebec and Pentland Ace potatoes did not succumb for another two weeks. The disease rapidly became general throughout potato crops in the Salisbury district. The severe blight conditions provided a good test for the various field resistant potato varieties being grown commercially. Most of these yielded well and the results of this season's experience indicate they offer considerable promise in alleviating the late blight problem. Late blight was also severe in first irrigation crops in Mashonaland.

Silver scurf (*Spondylocladium atrovirens*) was prevalent on tubers of the Voran variety in experimental plantings at the Salisbury Experiment Station.

The first outbreak of blackleg (*Erwinia atroseptica*) in a crop grown from imported Dutch seed was found in a first irrigation planting at Enterprise, approximately 5 per cent. of the stand being attacked.

Maize. Dry conditions during the critical period for infection by *Helminthosporium* leaf blight again checked any extensive development of this important disease. Although it was widely distributed throughout the principal maize growing districts little damage was occasioned to the crop as infection was generally confined to the lower leaves.

Several cases of severe chlorosis in young maize plants were reported during November. No disease pathogens could be found on affected plants and their erratic distribution together with the observed slow recovery to a normal condition suggested the trouble was due to low soil temperatures which obtained during prolonged periods of wet weather.

Tropical rust (*Puccinia polysora*) was even less in evidence than during the previous season. A light attack was noted at the "Panmure" Maize Breeding Station, Shamva.

Dry rot of cobs due to *Diplodia zeae* was fairly common but there was a marked reduction in the incidence of pink cob rot (*Fusarium graminearum*). A notable feature was the increased prevalence of seed infection by *Colletotrichum graminicolum.* The same fungus was also associated with a leaf spot disease of maize, new to Southern Rhodesia.

Streak virus was occasionally reported in low veld maize crops in the Eastern Districts but caused no appreciable damage.

Two interesting diseases of maize witchweed (*Striga asiatica*) were observed. A species of *Phoma* was discovered on several farms attacking the leaves and stems of the parasite. It appeared to be quite virulent, killing off *Striga* plants rapidly, often before they could set seed. The other disease was associated with a *Cercospora* sp. Work has been commenced to examine the possibilities of utilizing these pathogens for controlling this important plant parasite.

Castor Bean. Renewed interest in the possibilities of castor bean as a cash crop has been fostered by commercial companies and many farmers planted substantial acreages. A leaf spotting disease due to the bacterium *Xanthomonas ricinicola* appeared on young plants in several districts but caused little damage. Subsequently, a disease identified as due to *Alternaria ricini* became widely established and was particularly serious on early planted crops in the Fort Victoria district. Although primarily a leaf spotting disease and resulting in defoliation of the lower leaves *A. ricini* in severe cases also attacks the fruiting heads with consequent reduction in yield. Circumstantial evidence suggests it is probably seed-borne. Other diseases commonly observed attacking castor bean plantings included a leaf spot due to *Cercospora ricinella* and rust due to *Melampsora ricini.* Grey mould caused by *Botrytis cinerea* was recorded on the fruiting heads ("candles") in experimental plantings of hybrids at Hartley.

Forage and Green Manure Crops. Cowpea leaf spot due to *Ascochyta phaseolorum* was prevalent in many districts and caused considerable losses especially in the Mazoe Valley. The same fungus was also responsible for similar leaf spotting symptoms on Mung bean and Dolichos bean.

Another outbreak of ring leaf spot due to *Stemphylium sarcinaeforme* occurred on red clover.

Stem and vine rot of velvet bean due to *Phytophthora dreschleri* was again recorded from the Mazoe Valley but was not so widely distributed as in previous seasons.

Recommendations for controlling stem-break disease in Sunnhemp appear to have met with marked success, only one case of the disease being reported.

A species of *Cercospora* was determined from a leaf spot of *Crotalaria ochroleuca* whilst *Cercospora canescens* caused a leaf spot of cowpea. Mosaic symptoms, almost certainly due to virus, were found on sword beans (*Canavalia ensiformis*) at Gatooma and Hartley.

Puccinia coronata damaged a hybrid (HI) of *Lolium perenne* x *L. italicum* at Odzi and also attacked Italian rye grass and oats in the Chipinga area.

Sugar Cane. Smut (*Ustilago scitaminea*) appeared in cane plantings at Chirundu. Infection was noted in Co 331, Co 419 and N. Co 310 varieties.

Tea. Armillaria root rot destroyed a considerable acreage of tea at an estate on the Eastern Border.

Vegetables. Black rot (*Xanthomonas campestris*) was again the most frequently reported disease affecting Brassicas being common on cabbage, cauliflower and Brussels sprouts. Irrigated crops of these were particularly prone to infection. A severe outbreak also developed on kale in Bulawayo. Stem canker due to *Phoma lingam* was recorded for the first time attacking young cabbage plants at Melsetter.

Late blight became general on tomatoes and caused heavy losses in summer crops throughout the Colony. It was also prevalent amongst greenhouse crops in the Salisbury district. The disease persisted amongst both outdoor and greenhouse tomatoes until May. Leaf mould (*Cladosporium fulvum*) and bacterial spot (*Xanthomonas vesicatoria*) were both found in tomato plantings at Cashel. Further damage was caused by *Verticillium* wilt in tomatoes grown under glass. The same fungus, *V. dahliae*, also attacked eggplants at Arcturus.

A survey of field peas in the Eastern Districts revealed that *Fusarium* wilt was only serious in waterlogged areas, the main cause of unhealthy symptoms in the crop being due to heavy eelworm infestation. *Ascochyta* leaf spot, downy mildew and powdery mildew were also recorded on peas in the same region. Scab anthracnose due to *Elsinoë* sp. was less in evidence amongst French beans grown for canning than in previous years. Lettuce plantings were damaged by a leaf spot due to *Septoria lactucae*.

Fruit. Bitter rot *(Glomerella cingulata)* caused losses to susceptible varieties of apple in the wetter parts of the Eastern Districts. Mildew was especially severe on peaches and was also widely reported on mango and apple trees. Several reports of leaf curl *(Taphrina deformans)* on peach were received. Mildew due to *Uncinula necator* was prevalent on grape vines in many parts of the country during December and January.

An extensive search for the presence of latent black spot *(Guignardia citricarpa)* in citrus plantings throughout the Colony failed to reveal the presence of this serious fruit-spotting fungus on established trees.

Flowers. During routine inspections of dahlias grown from tubers imported under special permit three further cases of Kromnek (tomato spotted wilt) vines were discovered and destroyed. All infected plants were traced to a single supplier in Holland and had been introduced before the measures taken to prevent further importations from this source were put into effect.

Powdery mildews and rusts were unusually common on many garden hosts. Conditions also favoured the widespread development of black spot *(Diplocarpon rosae)* of roses during the summer months. *Fusarium* wilt of carnations was frequently reported and at least two commercial growers suffered considerable losses from this disease.

RESEARCH

Maize. Sufficient progress has been made in developing satisfactory techniques for testing varieties for their behaviour towards leaf blight to enable the routine variety resistance trials to be undertaken by the staff of the Salisbury Experiment Station. Our share in this work is now confined to preparing the inoculum from stock cultures and to making periodic check assessments. A further confirmatory experiment designed to ascertain the yield loss caused by *Helminthosporsium turcicum* was invalidated owing to the severe phytotoxicity arising from the use of a new non-ionic spreader, Triton X114.

For the second successive season no clearcut results were obtained from the large-scale experiment at the Gatooma Research Station, designed to compare the effects of stubble mulching and of ploughing under the normal trash cover from the previous crop with clean cultivation,

on the onset and intensity of leaf blight. Seasonal conditions did not favour the development of the disease and natural infection was exceptionally light.

Work on tropical rust *(Puccinia polysora)* was discontinued apart from field observations on locally selected inbreds at the Sabi Valley Experiment Station.

Wheat. The restricted programme of maize investigations permitted greater attention to be paid to wheat problems. Work was commenced on the identification of local races of wheat stem rust *(Puccinia graminis)* from winter and summer crops as an essential concomittant to the wheat breeding programme. Attention has also been given to varietal susceptibility towards leaf rust *(Puccinia triticina)* since this can be equally as destructive as stem rust under local conditions.

Potato. The appointment of a Potato Breeder made it possible to transfer the field trials with late blight resistant varieties to his care. A time of planting trial using supplementary irrigation was conducted at the Henderson, Grasslands and Matopos Research Stations to determine the value of this procedure in overcoming the late blight problem in summer crops of susceptible varieties. The experiment failed at Henderson due to exceptionally early rains being followed by an unusually severe outbreak of late blight in November, 1956. More promising results were obtained at Grasslands and Matopos where, in both cases, the earliest plantings gave the highest yields. Despite the complications induced by seasonal vagaries the results of these preliminary trials were sufficiently encouraging to justify their continuance next season.

Seven resistant lines were selected for further trial from the 65 genotypes retained from the original potato material supplied by the Union Department of Agriculture.

None of the three trials designed to compare various fungicides, stickers and time of application against late blight gave any appreciable measure of success under the extreme weather conditions experienced.

Further experiments on the transmission and control of potato blackleg *(Erwinia atroseptica)* were conducted in collaboration with the Department of Agriculture for Scotland. As in previous years the results were inconclusive and it has therefore been decided to suspend work on this problem pending the outcome of more basic studies overseas.

Investigations on the over-wintering of the bacterial wilt organism, *Pseudomonas solanacearum*, and its possble introduction to heavy soils through the agency of infected potato tubers, indicate that the disease may be disseminated by such means and that, depending upon soil moisture conditions, it can survive from one rainy season to the next.

Legumes. Evidence was obtained which confirmed the seed-borne nature of the stem-break disease of sunnhemp caused by *Colletotrichum curvatum.* Thiram (T.M.T.D.) was superior to an organic mercurial fungicide in seed dressing trials using seed collected from a crop heavily infected by stem-break.

Based on host relationships the fungus responsible for scab of French bean is now considered to be a distinct strain of *Elsinoë phaseoli* Jenk. and should be designated *E. phaseoli* Jenkins f. sp. *vulgare.* The results of field experiments point strongly to the disease being seed-borne although this has yet to be confirmed in the laboratory. The disease is carried over from one season to another in infected trash, consequently at least two years should be allowed to elapse before planting French beans again on land where scab occurred previously. Pole and haricot beans are resistant to scab infection whilst marked variations in susceptibility were found amongst the French bean varieties tested. Burpees Stringless was the most susceptible followed by Top Crop; all other varieties were much less susceptible and one unnamed selection appeared to be immune. Satisfactory control of both scab and anthracnose *(Colletotrichum lindemuthianum)* on the pods was provided by the fungicides Thiram, Maneb and Zineb (all at 2 lb. per 100 gallons) if applied at and shortly after flowering.

Deciduous Fruit. Experiments aimed at controlling bitter rot of apples by eradicant sprays during the dormant season and by protective cover sprays in the growing season gave inconclusive results owing to poor fruit set and hail damage.

Sulphur dust was superior to lime sulphur, wettable sulphur and Karathane against apple mildew. None of these fungicides provided satisfactory control of mildew on peach and nectarine trees in trials conducted during the season under review.

General. The pattern of disease in tomato crops was completely changed by the first recorded epiphytotic of late blight in summer plantings of this important crop. To deal with this new problem a replicated fungicide trial was laid down on summer grown tomatoes. Maneb gave the best overall control on leaves and fruit whilst Zineb though providing good results against leaf infection was less effective in protecting the fruit. Captan, on the other hand, afforded satisfactory control of fruit infection but was of little value against leaf infection.

Fungicides were also tested against other crop and vegetable diseases. Bordeaux Mixture (4:6:50) gave the best control of *Alternaria* leaf blight of carrots. Leaf spot of ground-nuts caused by *Cercospora arachidicola* was controlled equally well by copper oxychloride, Maneb and sulphur dust although the first-named fungicide was somewhat phytotoxic.

SEED TESTING

Reference is made in the introduction to this Report of the interest aroused in agricultural and horticultural circles by the considerable possibilities offered in producing certified seed of various kinds. The brunt of the work associated with developments in this direction has fallen upon the staff of the Seed Testing Laboratory. So much time has had to be given to answering inquiries on seed production and in dealing with the inspection aspects of this new industry that some of the other projects handled by this Section have had to be temporarily shelved.

Laboratory. The number of samples received for testing rose sharply to 1,520, an increase of 30 per cent. over the previous year. Six per cent. of all samples tested failed to satisfy the prescribed minimum standards. 2,324 germination tests were made for routine and investigational purposes. Numerous samples were tested for disease, hard seed content and for the presence of weed contaminants. 38 seed samples were identified.

Nearly half the total samples received consisted of maize. Legumes, grasses and cereals were also well represented followed by vegetables and tobacco.

The average percentage germination of certified maize was 98 compared with 96.3 for uncertified seed. Maize seed infection by *Diplodia zeae* was much the same as in the previous year but a marked reduction was noted in the incidence of *Fusarium graminearum* especially in hybrid samples. On the other hand, *Colletotrichum graminicolum* was more prevalent than in the past on hybrid seed handled by the Seed Maize Association, the significance of this remains obscure.

SEED PRODUCTION

1. *Grasses.* Production of grass seed increased substantially, some 51,000 lb. being produced under certification as against 29,500 lb. in 1955-56. Improved growing methods have been reflected in better yields and in standards of quality. Yields of 200 lb. and more per acre were obtained with Katambora Rhodes grass in the year of establishment using suitable rates of nitrogenous fertilizers. Better cleaning techniques have also been developed thus reducing the amount of blind seed and weed contaminants and increasing the pure live seed content.

Yields of the Ermelo strain of Weeping Love grass *(Eragrostis curvula)* were disappointing largely because of excessively high seeding rates. Other problems were also encountered with this grass, insect damage to the kernels caused serious losses in several plantings whilst an unidentified smut fungus also reduced seed yields. Two crops of Katambora Rhodes grass grown for certification had to be rejected because of heavy contamination with the related species *Chloris virgata* var. *elegans*. This latter species is highly susceptible to a rust disease and investigations have been commenced to determine whether the two Rhodes grass strains are also susceptible to the disease.

A satisfactory method for testing the germination of Weeping Love grass seed was developed. The depth of dormancy in Giant Rhodes grass seed was found to be appreciably greater than in Katambora Rhodes.

2. *Vegetables and Flowers.* The Rhodesia Vegetable and Flower Seed Growers' Association was formed during the year, its Constitution, Rules and Standards being prepared by the staff of this Section. The amount of flower and vegetable seed produced increased considerably, 108 acres of crops being registered and inspected. No less than 50 acres of peas were grown for certification.

Legislation. Forty-six samples were drawn from agents and merchants in the principal towns, nine were rejected as below standard as were another six samples submitted separately by the Police.

Amendments to the Seed Regulations, 1953, were drafted so as to permit the inclusion of additional crop and vegetable seeds. Revised standards for certain classes of seeds, notably pasture grasses, have also been prepared. It is proposed that the amended Regulations shall include provisions for controlling locally produced seed intended for export.

At the request of the Grain Marketing Board the Seed Testing Laboratory undertook the grading of maize grain intended for export. Depot managers of the Board were given a short course of instruction in sampling and grading techniques. Considerable attention was also paid to the drafting of new grading regulations designed to raise the standard of export grain.

Research. In a replicated trial using 17 fungicidal seed dressings on both chipped and healthy maize grain no significant differences due to the treatments were observed although chipped grain produced fewer and lighter seedlings than healthy grain. Planting grain showing severe infection by *Diplodia zeae* alongside chipped and healthy grain retarded emergence and depressed the weight of seedlings but caused no rotting.

Investigations designed to assess the behaviour of maize hybrids and inbreds towards infection by ear rotting pathogens were continued. Satisfactory standard techniques for inoculation and assessment of rotting have been developed as a result of experience gained during several seasons work on this problem. In addition to comparing the performance of new lines with established inbreds it is now possible to examine the effect of seasonal conditions on the suscepti-

bility of maize varieties towards the more common ear-rotting diseases. No striking sources of resistance have yet been discovered but a few hybrids exhibit considerable tolerance to *Diplodia zeae* and one is also fairly resistant to infection by *Fusarium graminearum*.

The large scale stubble mulch trial at Gatooma was again examined for the incidence of rotting diseases. Results followed much the same pattern as the previous year. Ear rotting due to *Fusarium moniliformae* was closely related with stalk borer damage which in turn was greater in trash plots and in plots receiving high nitrogen applications. Infection by *Diplodia zeae* was accentuated by stubble mulching but was markedly decreased by increasing levels of nitrogen.

Similar assessments of ear-rotting pathogens were made on several co-operative population/fertilizer trials conducted in different maize growing districts throughout the Federation. The results tend to confirm those reported above as far as nitrogen is concerned.

The incidence of maize ear rots in a variety trial at Gatooma revealed significant differences between the strains and varieties examined as regards total infection by *F. moniliforme*. A strong correlation was established between yield and *Fusarium* infection which, in view of the association between *F. moniliforme* and stalk borer damage, indicates that such insect damage has a considerable bearing upon maize yields.

In bushel weight determinations of samples from three population/fertilizer trials it was found that the bushel weights increased with increasing rates of nitrogenous fertilizer; phosphate treatments, however, had no apparent effect on this factor. A decrease in bushel weight with higher plant populations was only recorded in one out of the three trials examined.

Several seed dressing trials were conducted on cotton and sunnhemp seed using a range of available fungicides. In the case of cotton all the 20 fungicides tested gave improved emergence irrespective of whether the seed was acid or machine delinted. Only machine delinted seed showed differential responses to the various fungicides used. None of the 19 fungicides applied to sunnhemp improved emergence on seedling weight as compared with untreated seed.

Miscellaneous. The Branch was represented on several Departmental and other committees including the recently formed Rhodesia Seed Potato Association, the Rhodesia Pasture Seed Growers' Association and the Rhodesia Vegetable and Flower Seed Growers' Association. The Chief Botanist and Plant Pathologist continued as Liaison Officer for the Federation for the Commonwealth Agricultural Bureaux organization and as a member of the Federal Scientific Consultative Committee. During the year he was appointed a full member of the Scientific Council for Africa in which capacity he assisted in the preliminary arrangements for the 1957 annual meeting of this body in Salisbury during August. He also served as Chairman for the first Specialist Meeting on Stored Food Products convened by the Scientific Council which took place in Salisbury from the 21st-26th January, 1957.

Federal Department of Conservation and Extension

Annual Report for the year 1st October, 1956—30th September, 1957

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REPORT OF THE FEDERAL DEPARTMENT OF CONSERVATION AND EXTENSION FOR THE YEAR ENDED 30th SEPTEMBER, 1957

SOUTHERN RHODESIA

1. ORGANIZATION

Due to improvements in grading and the creation of a few new posts, the staff position in the Department improved during the year under review and made it possible for a very much better and complete advisory service to be given to I.C.A. Committees and farmers than was the case 12 months ago. The return to their normal duties of a substantial number of field officers after having been engaged on tobacco training for the 1956-57 season, has also had a beneficial effect in that it has helped to relieve some of the pressure on the staff in areas where help was most needed.

(a) Head Office

Comparative stability has been attained in the clerical sphere in Head Office. There have been no staff changes of note and the efficiency of this section has, in consequence of this fact, benefited greatly.

The appointment on the 1st July, 1957, of a Chief Planning and Training Officer and of a Senior Conservation and Extension Officer has helped to ease from the shoulders of the Director and Deputy Director a portion of the great administrative load that they have carried hitherto—thus making it possible for them to devote more time to meeting I.C.A. and Group Committees, Farmers' Associations and junior officers in the field. Considerable responsibility attaches to the post of Chief Planning and Training Officer who, as his title indicates, is concerned among other things with in-service training and farm and regional planning in all their aspects.

(b) Regional Offices

Owing to staff difficulties, administration in these offices has not in all cases been entirely satisfactory, but the position is steadily improving.

During the year under review full-time African clerical assistance was given to four Group Offices. This is an important step forward and will enable the Group Officers, like their colleagues who have already had part-time clerical assistance for one or two years, to spend much more time in the field.

(c) Intensive Conservation Areas

Although no new I.C.A.s have been declared during the last 12 months the boundaries of many of them, for various reasons, have had to be re-aligned.

The current position in regard to I.C.A.s in Southern Rhodesia is as follows:—

(i) Declared during the year: Nil.

(ii) Investigated or under investigation for declaration: The whole of the existing European farming area is now proclaimed and only new areas such as those under consideration for subdivision and alienation will have to be brought into existing I.C.A.s or declared as separate units once they are occupied.

(iii) Subdivided during the year: Selous was split into two to form Gadzema and Selous I.C.A.s.

(iv) Investigated or under investigation for subdivision: Umvukwes.

(v) Boundaries changed: Ruwa, Bromley, Salisbury West, Marodzi-Tatagura, Gwebi-Hunyani, Darwendale, Glendale, Angwa North, Angwa South, Bubi, Inyati, Mchingwe, Selukwe, Gwelo, Gwelo East, Umvuma, Bindura, Selous, Norton, Matopos South, Marandellas North and Wenimbi.

(vi) Investigated or under investigation for boundary changes: Mchingwe, Selukwe, Belingwe-Shabani, Filabusi, Nyandora, Mrewa, Odzi, Umvukwes and Darwin.

(vii) Areas declared: A total of 91 I.C.A.s have now been declared in Southern Rhodesia.

(d) I.C.A. Committees

As has been the case in the past I.C.A. Committees have played a role of the greatest significance in the territory's conservation movement because they have acted as the vital link between the Natural Resources Board and the farmers, and it has been due in large measure to their support that field officers of this Department have been able to accomplish as much as they have done during the year that is covered by this report.

It would be difficult to exaggerate the importance of the help that the various I.C.A. Committees have afforded this Department in carrying out its functions. By their participation in aerial flights over their respective areas, by their visits to farms, the holding of Farmers' Days and their keen interest in farm planning they have done much to further the cause of conservation during the year.

(e) **Group Organization**

The Group Organization too, has functioned in an efficient manner and the degree of liaison between the various Group Committees and their respective Group Conservation and Extension Officers has been gratifyingly high.

There is no doubt that a most useful purpose has been served by the quarterly meetings between Chairmen of the Group I.C.A. Committees, the Chairman of the Natural Resources Board and the Director of this Department. The high level discussions made possible by these meetings have helped to co-ordinate the effort of all those most intimately concerned with conservation and have gone a long way in helping to stimulate the less progressive I.C.A. Committees to greater endeavour in the attainment of their objectives.

2. STAFF

(a) **Establishment**

The year under consideration witnessed a marked improvement in the general staff position. This was due to a number of factors the most important of which were the improvement in the grading structure effected during the previous year, the appointment of a fairly large number of officers in direct consequence of the Director's tour of the United Kingdom and South African universities and the return to active field duty during the middle of 1957 of nine experienced officers from tobacco training.

Two additional posts were authorized at the beginning of July, 1957, and filled as from that date. These were:—

Chief Planning and Training Officer whose major duties, among many others, include—

(i) advising the Director and Deputy Director on all matters of policy affecting the Department in connection with land-use planning and associated problems;

(ii) superintending the organization of all farm and regional planning;

(iii) the organization of all in-service training of officers of the Department; and

(iv) organization and control of all short courses for farmers, teachers and officials.

Senior Conservation and Extension Officer. The principal function of the latter is to assist the Director and Deputy Director in matters pertaining to professional administration and, in so doing, free them from some of their burden of routine office work that hitherto has largely prevented them from moving about the country.

This officer does a limited amount of advisory extension work in order to help him keep abreast of scientific developments in agriculture and also because it is realized that it would be fundamentally unsound to divorce from practical field activity an officer professionally trained in agriculture.

In addition to the two posts that are mentioned above, the Department availed itself of the authority that it had been given by the Cabinet in 1956 and appointed seven officers for the specific task of undertaking conservation work in the Sabi River Catchment on a planned, scientific basis. This particular team, consisting of an Additional Group Conservation and Extension Officer, five Conservation Officers and one Agricultural Topographer, actually came into being in July, 1957.

The following table gives details of the establishment of the Department:—

	Authorised 30–9–1956	*Authorised* 30–9–1957	*Requirements*
Administration (including Professional Staff at Head Office)	15	15	16
Regional Clerical Staff	9	9	9
Regional Conservation and Extension Officers	4	4	4
Additional Regional Conservation and Extension Officers	—	4	4
Group Conservation and Extension Officers	13	20	27
Additional Group Conservation and Extension Officers	18	7	—
Conservation and Extension Officers	79	84	91
Animal Husbandry Officer	1	1	1
Chief Conservation Engineer	1	1	1
Conservation Engineers	4	4	4
Agricultural Engineer	1	1	1
Mechanical Engineer (seconded from C.M.E.D.)	1	1	1
Irrigation Officers	2	2	2
Young Farmers Clubs' Organizers	2	2	3
Chief Tobacco Extension Officer	1	1	1
Tobacco Extension Officer	1	1	1
Chief Planning and Training Officer	—	1	1
Senior Planning Officer	—	1	1
Agricultural Topographers	5	6	6
Farm Managers and Assistants	4	4	4
Information Officer	—	—	1
Mechanical Unit Inspectors	4	6	4
Horticulturist (seconded from Department of Research and Specialist Services)	2	1	1
Horticulturist (contract)	—	1	1
Soil Technicians (seconded)	1	2	3
African Conservation Assistants	18	22	24
African Survey Hands	116	116	116
African Clerks (Group Officers)	4	4	10
TOTALS	306	321	338

(b) **Visits to Other Countries**

United States of America. The Chief Tobacco Extension Officer (Mr. Colin Rose) visited the United States of America, Canada and the United Kingdom during 1957 on a tour of approximately eight months' duration for the express purpose of studying the production, general handling and manufacturing aspects of tobacco.

Mr. G. Turck (Senior Irrigation Officer) returned from an instructive eight months' sojourn in in the United States of America in October, 1956, during which time he studied closely irrigation in all its aspects. He also spent a short time in the United Kingdom, Italy, Israel and the Sudan on his return journey in order to gain further information on this particular subject.

Mr. T. de la Hunt, Group Conservation and Extension Officer, Bulawayo, spent approximately six months in the United States of America engaged on a study of farm planning in the semi-extensive beef producing areas. He also paid attention to the technique of cattle raising in the more arid areas and visited a few outstanding breeders of cattle and pigs in Holland and Great Britain (as well as the Smithfield Market) on his homeward journey.

The Senior Agricultural Topographer (Mr. R. G. B. Jones) attended a course at the International Training Centre for Aerial Survey in Delft, Holland, which lasted for six months. In this he particularly distinguished himself in the face of competition on the part of students from many different countries.

On completion of this course he spent four months in the United States of America during 1957 studying the most advanced techniques of photogrammetry and the best methods of utilizing to advantage the information derived from aerial photographic interpretation in speeding up the Department's farm planning programme.

Union of South Africa. Mr. N. W. Hudson, the Conservation Engineer in charge of the Conservation Research Work at Henderson Research Station, spent approximately a month in the Union of South Africa during June, 1957, visiting various universities and Government Research Stations in order to study at first hand achievements in the sphere of erosion and hydrological research.

The Horticultural Officer attached to the Eastern Region (Mr. M. A. Cassidy) attended a course on Citrus Fruit at Nelspruit for a period of five days in May and a course on Deciduous Fruit Culture in Stellenbosch for a similar period in July.

East Africa. Mr. N. W. Hudson (Conservation Engineer, Erosion Research) represented the Department at the Conference on Hydrology and Water Resources that was held in Nairobi during the period 16th to 21st September.

Before the Conference Mr. Hudson was fortunate enough to be able to visit the Empire Cotton Research Station at Kampala in Uganda and the Coffee Research Station at Ruiru in Kenya.

It is desired to record here the Department's deep gratitude to the International Co-operation Administration for having given the financial aid which made possible the visit to the United States of America of Messrs. Turck and de la Hunt. Likewise the Department is deeply indebted to the Food and Agricultural Organization of the United Nations under whose auspices Mr. Rose proceeded to the United States of America and Mr. Jones to Holland and the United States of America.

(c) **Departmental Committees**

The Director served on the following committees during the year:—

(i) Federal Standing Committee on Agricultural Production.
(ii) Livestock Improvement Committee (Chairman).
(iii) Natural Resources Board of Southern Rhodesia (Advisory).
(iv) Cabinet Sabi Development Committee.
(v) Water Resources Committee of Natural Resources Board.
(vi) Tobacco Research Board of Rhodesia and Nyasaland.
(vii) Kariba Lake Fisheries Committee.

The Assistant Director served on:—

(i) Subdivision of Lands Committee of Natural Resources Board.
(ii) Native Affairs Committee of Natural Resources Board.
(iii) Sabi Development Farm Committee.
(iv) African Agricultural College Committee.

The Chief Conservation Engineer served on:—

(i) Inter-Departmental Committee on Hydrology.
(ii) C.M.E.D. Co-ordinating Committee.

In addition other Senior Officers of the Department, at both Head Office and Regions, served on numerous inter-departmental and other committees during the year.

(d) **Publications**

The Department was responsible for the following publications during the year ended 30th September, 1957:—

(i) Effect of Feeding Mineral, Protein and Carbohydrate Supplements to Growing Beef Cattle in Mashonaland — Rhodes, F. B. R.A.J., Vol 53, No. 6, November-December, 1956.

(ii) Survey of Existing Methods of and Recommendations for Future Beef Production in the Marandellas Group of I.C.A.s with Reference to Management, Feeding and Economics — Collett, A. J. R.A.J., Vol. 53, No. 6, November-December, 1956.

(iii) Erosion Control Research—Progress Report on Experiments at Henderson Research Station, 1953-56 — Hudson, N. W. R.A.J., Vol. 54, No. 4, July-August, 1957.

(iv) Engineering Problems in Overseas Agriculture II, Agricultural Engineering in Rhodesia — Hudson, N. W. Journal of Agricultural Engineering and Research, Vol. 2, No. 3, 1957.

In addition to the above numerous articles and notes by officers of this Department appeared in the Rhodesian Farmer and other publications.

3. TRANSPORT

Due to the widespread use of private vehicles on Government duty the transport situation in the Department during the year was very satisfactory and the time lost due to mechanical failures was negligible. A total of 124 authorized private vehicles are currently being used by field officers on official work. The number of C.M.E.D. vehicles of all kinds at present in service with the Department is 40.

4. EXPENDITURE

Vote		Federal Headquarters and Southern Rhodesia Item	1956–57 Authorised	1956–57 Actual	1957–58 Authorised and Anticipated Expenditure
39 1	A	Salaries, Wages and Allowances	209,327	207,520	235,700
	B	Travelling and Subsistence	16,500	21,579	17,700
	C1	Books and Periodicals	*Nil	*Nil	310
	C2	Camping Equipment	200	176	40
	C3	Experimental Equipment for Conservation Works	3,400	2,841	2,100
	C4	Leave Entitlements	1,000	991	1,000
	C5	Office and Miscellaneous	1,800	1,898	1,730
	C6	Purchase and Upkeep of Instruments and Technical Furniture and Equipment	3,400	3,609	2,860
	C7	Recruiting Expenses	4,000	3,844	900
	C8	Water, Light and Sanitary Charges	1,200	1,063	1,250
	D	Housing	16,000	16,253	7,900
	E1	Conservation Works and Measures on European Farming Land in terms of section 23 of the Natural Resources Act of Southern Rhodesia, 1941	14,000	10,181	4,000
	E2	Grass Nurseries, Other Conservation Works and Measures and Field Trials	12,000	11,778	6,700
	F1	Chipinga Experimental Farm	6,200	4,209	5,350
	F2	Karoi Experimental Farm	5,550	5,410	5,250
	G	Transport and Equipment	79,000	75,068	75,400
	H	Farm Planning, Air Photography	Nil	Nil	5,600
	J	Assistance to University Students:			
	1	Bursaries	1,500	848	1,500
	2	Loans	1,000	653	1,000
	K	Transfer Adjustments	1	934	200
		TOTAL	£376,078	£368,855	£376,490

* Previously on Ministry's General Vote.

5. GENERAL AGRICULTURAL CONDITIONS

(a) **Climatic Conditions and General**

Generally, good rains fell in November. Subsequent distribution varied considerably as did the total rainfall. Crops in some areas suffered to some extent in consequence of prolonged spells of overcast and cool weather during November and December, and again in certain areas from a dry spell which varied from five to seven weeks during January and February. However, with few exceptions grazing and water supplies were satisfactory.

(i) *Mashonaland.* Good planting rains fell in early November but the total precipitation and distribution through the season varied greatly. The prolonged spells of overcast and cool weather in November and December had a most adverse effect on crops. In addition considerable damage to crops by hail took place in certain areas. The winter was mild and with isolated exceptions frost incidence was light.

(ii) *Midlands.* Generally the total precipitation was above normal but the distribution was poor and in the lowveld a severe drought was experienced. In the remainder of the region crops and grazing were slightly affected by a general mid-season drought. Despite this cattle remained in good condition throughout the mild winter except in the lowveld where water scarcity took its toll.

(iii) *Eastern.* After an exceptionally good start to the rainy season in early November, a continued overcast spell until the end of December followed by a six weeks' drought very seriously affected crops. Hail caused considerable damage to some tobacco and fruit crops. Late season rains were inadequate and the winter rains along the eastern border have been very poor. Winter temperatures were mild and spring rains were most disappointing.

(iv) *Matabeleland.* Good planting rains fell in late October and adequate rains continued until the end of December when crops looked very promising. This satisfactory early season was followed by a five to seven weeks' drought in January and February, at the end of which good rains fell and crops and grazing recovered and dangerously low water supplies in the lowveld were boosted. The winter was mild. Frost incidence was insignificant.

(b) **Crop Production**

(i) *Food Crops. Maize.* The wide variation in maize yields may to a very large degree be related to the pattern of the rainfall that was experienced during the year. Those areas which suffered long periods of cool, overcast wet weather followed by a prolonged drought produced very disappointing results while other areas which suffered the mid-season drought only produced slightly below average to slightly above average yields. Certain areas enjoyed good distribution and produced crops that were considerably above average. The standard of management has continued to improve rapidly. It is interesting to note that stubble mulching and trash cropping of maize are becoming increasingly accepted by farmers and in certain areas may be regarded as "standard" practices.

In those areas which experienced a higher rainfall Helminthosporium, Diplodia and Stalk Borer appeared on a widespread scale; the increasing incidence of the latter caused some concern in certain localities. The incidence of Helminthosporium was, however, not as severe as during the previous year.

Sorghums. Very little interest has been evinced in sorghums. Judging by the success shown by certain isolated commercial growers, sorghum appears to be particularly well adapted to a combination of high temperatures and heavy black or red soils in the lower rainfall areas. Under these conditions it could effectively replace maize as the grain crop.

Munga. Despite its suitability (with adequate fertilization and management) as a fodder and grain crop in the lower to medium rainfall sandveld areas, munga continues to receive little recognition.

Ground-nuts. In certain higher rainfall areas where yields were good, interest in this crop is growing. It is disappointing to record, however, that little progress has been made in extending the acreage planted to this fairly drought resistant, good rotational, valuable protein and oil crop in the lower rainfall areas.

Legumes and Green Crops. Velvet beans, cowpeas and sunnhemp continue to be grown on a fairly large scale as green crops, and to a lesser degree for hay and silage purposes. In some areas during the year covered by this report green crops were a failure due to continued wet weather and in others hay crops were damaged by rains in April and May.

Increasing interest is being paid to the establishment of dahl in "foggage" pastures and also as a green crop.

In the Eastern Region, due to the demand by the canning factories, beans are rapidly becoming an extremely popular cash crop that has the additional merit of being quick growing and useful in rotations. Drought and Bean Fly larvae affected the bean crop to some degree during the 1957 season.

Wheat. There is definitely an interest in the production of wheat and increased acreages were established to dryland wheat in the Kalahari sandveld vlei areas. Little further increase in summer production of wheat can be expected until more suitabale rust resistant varieties become available.

Irrigated winter wheat is still being produced in many areas of the Colony and there is even a possibility of this acreage being increased, as improved methods and higher yielding varieties make the crop more profitable. It is considered that there is an urgent need for developing higher yielding winter wheat varieties with a strong stem to prevent lodging. Once yields can be increased to the order of 15-20 bags per acre, this crop will be produced on an increasing scale under irrigation in rotation with other crops.

Barley. The crop during the season under review was a small one due, partly, to the quota system imposed by the breweries which had the effect of limiting the acreage that was planted by farmers. A mild winter unfortunately favoured a very large build up of aphid which has affected

certain crops in some localities. Yields generally, however, are good. It is still the most popular winter irrigated grain crop.

Potatoes. Both the summer and first irrigated crops suffered in varying degress from late blight and yields therefore, with few exceptions, were considerably reduced. The second irrigated crop promises well.

Vegetables. Peas, to satisfy the canners' requirements, are rapidly becoming the chief cash crop of the Eastern Districts where production of all vegetables, in particular tomatoes, is on the increase.

Elsewhere production and marketing remained erratic and uncertain. The mild winter ensured good yields in the lower rainfall areas where, it is felt, there is great scope for increased production in order to overcome the periodic critical shortages of vegetables that occur from time to time.

This year also marked the opening of the canning factory at Cashel by Messrs. Leibigs, who have also taken over the factories of Messrs. Sunrho at Umtali and Chipinga. With these facilities available and with improved transport arrangements there has been a steady increase in production of fruit and vegetables in the Eastern Districts.

Fruit. The interest in sub-tropical fruit continues to grow strongly in the Eastern Districts where, in common with the Midlands, citrus orchards are being established on an increasing scale. Citrus yields generally have been heavy.

In the Eastern Region bananas suffered a price setback as a result of competition from Portuguese East Africa. The existing productions of paw-paws and pineapples has satisfied local requirements. Should their canning properties be satisfactory, a considerably increased acreage of grenadillas will be seen in the next few years.

There has been a positive all round improvement in every aspect of diciduous fruit production in the Eastern Districts.

It is worth recording here that the demand by canners for peaches in this particular part of Southern Rhodesia is considerable.

The importance of the availability of supplementary irrigation should the rains fail cannot be over-emphasized.

(ii) *Cash Crops. Tobacco.* The past season's crop, after a severe climatic setback in most areas, recovered to achieve the second highest total national yield in the country's history. The gross earnings of the industry were higher than ever before. Many growers as a result of their experience in the 1955-56 season, during which a large weight of tobacco was not reaped, increased their barn accommodation and handling facilities, while others reduced their individual acreages. The outcome was a crop that was handled in a much improved manner which resulted in enhanced quality and a much lower percentage of nondescript tobacco (10.113 per cent. as compared with 15.955 per cent. in 1955-56).

The above observations suggest that improved methods of production in general use today have counteracted the effects of an awkward season, and that any increase in acreage which is not accompanied by an increase in barn accommodation and improved handling facilities must lead to wastage if growing conditions produce an above average yield per acre.

More and smaller sections worked intensively are the need today if production is to increase without loss. It is pleasing to report that there is a noticeable trend in this direction.

Except for the widespread outbreak of Anthracnose in seedbeds and the heavy incidence of rosette later in the season, disease and pests were generally less prevalent than during the previous season.

Cut worm and wire worm damage was extensive but the more general use of insecticides is reducing the incidence of infestation by these pests.

The greatest disease problem facing growers is rosette. Results of work by the Tobacco Research Board have shown that spraying against aphid in the seedbeds and during the first four weeks after transplanting largely controls the disease. These measures and the early destruction of all tobacco plants after reaping can effectively reduce the serious losses in yield and quality which occur annually.

The establishment of improved grasses in the tobacco rotation continues apace.

The following table reflects the position in regard to the production and marketing of the flue-cured tobacco crop:—

	S.R. & N.W.R. 1956/57	N.E.R. 1956/57	S.R. & N.W.R. 1955/56	N.E.R. 1955/56
Number of growers	2,917	48	2,868	65
Total acreage	185,000*	2,000	204,026	3,860
Sold weight — total lb.	144,285,536	1,283,587	171,629,668	1,979,258
Average yield — lb./acre	780*	642*	841	513
Average crop size — (acres per grower)	64*	42*	71	59
Total value of crop	£23,671,511	£164,353	£23,569,144	£196,847
Average price — pence per lb.	40·08d.	30·73d.	32·96d.	23·72d.
Average return per acre in £s.	£128*	£83*	£116	£51
Average income per crop	£8,115	£3,424	£8,083	£3,021

* Figures estimated from provisional acreage.

The production of fire-cured continues its downward trend. Statistics are as follows:—

	1956/57	1955/56
Number of growers	3	19
Acres	150*	630
Total weight sold — lb.	94,730	342,482
Average yield per acre — lb.	630*	713
Average crop size — acres	50*	24
Total value of crop	£7,568	£14,169
Average price — pence per lb.	19·17d.	0·93d.
Average return per acre	£50 10 0*	£29 10 0

* Estimated figures.

Despite a revival in price paid for this tobacco the number of growers is unlikely to increase in consequence of the considerable interest in Burley tobacco that has arisen in the fire-cured producing areas.

Cotton. Very little interest in cotton is at present shown by farmers.

Castor Bean. Generally speaking yields of castor bean have been disappointingly low, one of the reasons being that disease incidence (particularly alternaria) has been high. It is anticipated that there will be an increase in the acreage planted in the medium rainfall areas in the next few years.

Fibre. Considerable expansion of acreages under this crop is taking place — particularly on farms that have summer supplementary irrigation rights.

Grass Seed. Continued progress is being made in the production of high quality certified grass seed, the demand for which is very great.

Tea. Tea gardens are being expanded on the existing estates at Chipinga at an increasing rate. The new tea venture in the Honde and Pungwe Valleys in the Inyanga area has made spectacular progress. Some 420 acres have been established and considerable expansion is foreseen.

Coffee. Great interest is shown in the potential of this crop in the Eastern Districts, and small scale plantings are on the increase.

Nuts. Renewed interest is being shown in Pecan nuts and trial plantings of imported Macadamia nuts have taken place.

Softwoods. Poor rainfall in the planting-out months of January and February again limited the acreage of effective plantings but new techniques of planting out undisturbed seedlings in paper pots has largely overcome this hazard. Private plantings of softwoods in the Eastern District has again increased.

Wattle. Farmers continue to show interest in wattle production and increased acreages are being planted. The various wattle companies are also extending their plantings and the factory near Melsetter is now in full operation.

(iii) *Stock Feed.* Steady and encouraging progress has been made in this very important facet of production. There is a rapidly growing appreciation among farmers of the necessity of supplementing the natural veld, in particular with high quality protein feeds during the winter months, in order to ensure an economical calving percentage and to achieve continuous growth and earlier maturity of stock. Although progress is claimed, there is no doubt that optimum requirements of high quality feeds for both dairy and beef herds are not produced. There is scope for great improvement in this direction.

Maize and sweet sorghums under-planted with velvet beans proved the most popular silage crops, and in the higher rainfall areas there was an increase in the amount of grass silage that was made. Velvet beans and cowpeas were the most popular hay crops. Of the different crops grown under irrigation (which is developing fast in all areas) lucerne is gaining in popularity as are the winter cereals. In the higher rainfall areas the extension of the summer grazing period through the medium of improved pastures is most encouraging. Much interest is being shown in the "foggage" value of these pastures.

The establishment of grass clover pastures continues apace on those farms where the demand exists and where adequate water is available.

A considerable amount of interest has been shown in the feeding of urea as a protein supplement from which practice very good results have been obtained. There is no doubt that the feeding of this preparation can play a revolutionary part in alleviating the critical protein deficiency that is suffered during the winter months in Rhodesia.

(c) **Livestock**

Notwithstanding a fairly severe drought in some areas during January and February the past year may be described as having been a relatively good one for livestock.

(i) *Cattle. Beef Cattle.* There is a growing appreciation on the part of the farming community of the fact that in order to increase production and profits, stock must be fed and managed properly.

Good progress is being made in certain aspects of beef production such as in the care that is being given to breeding stock by the more progressive farmers who ensure that—

(1) breeding is controlled;

(2) weaning time is arranged in such a manner that cows are not drained excessively;

(3) heifers are prevented from calving at too early an age;

(4) selection of breeding stock is based on "economic" characteristics;

(5) systematic identification and recording of breeding stock is undertaken;

(6) adequate handling facilities are available;

(7) animals are inoculated against diseases such as Quarter Evil and Contagious Abortion; and

(8) the best possible bulls are used.

The standard of management is improving in an encouraging manner in many ways, not the least important among which being the feeding aspect — in particular the provision of supplementary protein during the winter — which is now receiving a great deal of attention.

The increasing use of grass leys in the tobacco rotation will undoubtedly increase the potential for running small beef herds in the tobacco areas — a development that can only be welcomed.

Officers of the Department with the assistance of I.C.A. Committees continued to emphasize the place of livestock in the country's farming systems. Numerous field days, demonstrations and a few cattle courses (many more of the latter are to follow) were organized with the main emphasis on livestock management and production. Specialists from the Department of Research and Specialist Services gave very able assistance in this programme.

The problems of low calving rates, high mortality, nutrition and slow rate of growth must be overcome on each farm before it can be claimed that progress is completely satisfactory.

Dairy Cattle. Good progress has been maintained in the breeding, feeding, management and production of dairy herds. Good bulls, selected on production records, are being used at an increasing rate.

The main shortfall in economic dairy production is the inadequacy of the supply of high quality roughage. Room for improvement also exists in the general management and feeding of calves and young stock. However, the dairy bonus scheme is doing much to improve the position.

(ii) *Sheep.* The running of sheep formed a useful sideline on many farms and provided a valuable source of revenue in those instances where due regard was paid to internal parasite control, supplementary feeding and controlled breeding.

Interest in this form of production is growing rapidly. During the year the demand from local breeders for both rams and ewes far exceeded the supply and some 350 head were imported into the country. Dorper and Blackhead Persian continue to be the most popular breeds.

Relatively few flocks of woolled and dual purpose sheep are in existence at the moment but considerable interest in these breeds is developing in tobacco areas where pasture establishment is proceeding apace.

(iii) *Goats.* No increase in interest in goats has been reported. Goats of the right type can play a very useful part in helping to control bush encroachment, and can provide a cheap source of meat for local farm labour.

(iv) *Pigs.* Agalactia continued to cause severe losses in parts of the country during the year but despite this fact a considerable expansion in pig production has taken place in some areas. In others, however, a decline in interest was noted.

The cheaper housing on the drop litter court system and also on pastures, are two aspects which, coupled with other sound research findings, have done much to bolster this form of livestock production.

(v) *Poultry.* The year again proved satisfactory for the poultry farmers. Production which is on the increase, particularly in the vicinity of larger towns and cities, was in keeping with demand.

(vi) *Fish.* Dams continue to be stocked. There has been the development of no little interest in the use of the gill net, which appears to be a relatively cheap and yet successful means of netting — especially in those dams rich in obstructions such as weeds and tree stumps.

(vii) *Livestock Improvement Scheme.* During the year six meetings of the Livestock Improvement Committee were held at which 169 applications for grants were considered. This figure represents a decrease compared with that of the previous year but is not entirely accurate because at the end of September a number of applications had still to be dealt with. It is encouraging to report that applications continue to come in from farmers applying for the first time, due, no doubt, to the work and advice of the Conservation and Extension Officers.

While non-African Agriculture in Northern Rhodesia is now a Federal responsibility the Union Department did not grant a separate quota to each territory, but granted one to the Federation as a whole. The Livestock Improvement Committee (Southern Rhodesia), after obtaining the requirements of Northern Rhodesia and Nyasaland, recommended to the Federal Ministry of Agriculture that the quota should be shared as follows:—

	Quota Received	*Southern Rhodesia*		*Northern Rhodesia*	*Nyasaland*
		1956	1957	1957	1957
Pedigree Dairy Females	400	193	260	120	20
Grade Dairy Females	1,500	600	725	725	50
Pedigree Beef Females	200	180	140	50	10
Grade Beef Females	150	167	65	75	10
Pedigree Bulls	No restrictions				

These recommendations, which were accepted, made it possible to satisfy (with the exception of the grade dairy females, of which Northern Rhodesia required 1,500) virtually all the requirements of the three territories.

Details are given below of stock that were purchased and imported for farmers by the Livestock Improvement Committee and of stock that were imported by farmers on their own behalf.

CATTLE IMPORTED FROM THE UNION OF SOUTH AFRICA

	1.10.56 to 30.9.57	1.10.55 to 30.9.56	1.10.54 to 30.9.55
Pedigree Bulls			
Ayrshire	—	—	5
Friesland	39	21	34
Guernsey	—	1	4
Jersey	9	11	12
Aberdeen Angus	9	1	—
Afrikander	125	158	173
Hereford	8	2	3
Shorthorn	1	1	2
Sussex	47	21	7
South Devon	2	4	—
Red Poll	1	1	—
Brown Swiss	2	1	6
Brahman	—	1	—
TOTALS	236	223	246
Pedigree Females			
Ayrshire	4	33	32
Friesland	44 plus 1 calf	58	33 plus 1 calf
Jersey	16	54 plus 1 calf	70
Guernsey	—	10	11
Afrikander	77 plus 8 calves	187 plus 41 calves	92 plus 1 calf
Sussex	—	26	—
Brown Swiss	3	5	2
North Devon	17 plus 1 calf	—	—
Red Poll	5	—	—
TOTALS	166 plus 10 calves	373 plus 42 calves	240 plus 2 calves
Grade Females			
Ayrshire	6	—	13
Friesland	219	364 plus 12 calves	500 plus 9 calves
Jersey	157 plus 9 calves	177	334
Guernsey	9	—	—
Red Poll	—	5	—
Afrikander	—	4	20
Shorthorn	9	—	—
South Devon	16	—	—
Sussex	10	—	—
TOTALS	426 plus 9 calves	550 plus 12 calves	867 plus 9 calves

Importations under Special Permits granted by the Union Department outside the quota were as follows:—

10 Pedigree Afrikander Bulls.
1 Friesland Grade Bull.
10 Afrikander Grade Bulls.
20 Grade Shorthorn x Afrikander Bulls.
2 Grade Brahman x Afrikander Bulls.
4 Pedigree Jersey Females.
10 Pedigree Sussex Females.
25 Pedigree Afrikander Females + 20 Calves.
10 Grade Friesland Females.
26 Grade Jersey Females and 9 Calves.
10 Grade South Devon Females.
10 Grade Sussex Females.

The following cattle were imported from the United Kingdom:—

	1.10.56 to 30.9.57		1.10.55 to 30.9.56		1.10.54 to 30.9.55	
	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers
Ayrshire	—	12	5	22	2	16
Friesland	—	1	1	—	—	—
Jersey	2	2	1	—	—	31
Aberdeen Angus	—	—	—	—	3	—
Hereford	—	—	—	—	3	5
Shorthorn	—	5	—	—	1	2
Red Poll	—	—	1	2	—	—
TOTALS	2	20	8	24	9	54

Cattle imported from the United States are listed below:—

	1.10.56 to 30.9.57		1.10.55 to 30.9.57		1.10.54 to 30.9.55	
	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers
Brahman	4	6	7	32	—	—
Santa Gertrudis	4	12 plus 1 calf	—	—	—	—
TOTALS	8	18 plus 1 calf	7	32	—	—

Santa Gertrudis were imported into the country for the first time during the year and aroused a great deal of interest.

Sheep. A total of 61 head were imported from the Union for farmers by the Livestock Improvement Committee; a further 290 head were imported by farmers themselves during the year.

Sheep. A total of 61 head were imported from the Union for farmers by the Livestock Im- Large White breed, were made from the United Kingdom and the Union of South Africa.

Breed Societies. Inspectors of the Afrikander, Friesland and Jersey Cattle Societies visited breeders and besides carrying out inspections, gave demonstrations on farms to interest farmers in the area. The Inspectors were in most cases accompanied by Extension Officers and the tours were arranged through this office by the Animal Husbandry Officer.

6. PRODUCTION FROM IRRIGATION

After his return from his overseas tour in early October (to which reference has already been made in this report), the Senior Irrigation Officer, stationed in Salisbury, spent a considerable amount of time disseminating the information that he had gained through the medium of addresses to farmers at field days and meetings of Farmers' Associations and I.C.A. Committees. With the same object in view, eleven short courses on irrigation were held by this officer in various parts of the country for the benefit of the field staff of the Department. These proved both instructive and interesting.

The Irrigation Officer, stationed at Gwelo, was actively engaged in the field for only seven months during the year — the remaining period being devoted to long leave of absence and to a month's tour of the major irrigation schemes in the Union of South Africa.

It is estimated that during the year under review an additional 5,000 acres were placed under irrigation and it is considered that this increase has been more or less an annual one since the establishment of the Department's Irrigation Advisory Service in 1953. Prior to the latter date

the annual increase in land under irrigation was approximately 1,000 acres, the total area under irrigation during that particular year being some 14,000 acres — about 25,500 acres less than the current total for the country.

Only slightly more than half of the total area of 53,000 acres for which water rights have been granted is at present being used.

Estimates of various crops that were grown under irrigation during the year are as follows:--

Tobacco	8,000 acres	summer supplementary irrigation
Maize	3,000 acres	
Orchards	5,000 acres	
Vegetables	5,000 acres	
Stockfeeds	3,000 acres	
Wheat	2,500 acres	
Barley	2,500 acres	
Lucerne	2,500 acres	
Winter Potatoes	2,000 acres	
Sugar cane	4,000 acres	
Miscellaneous	2,000 acres	
TOTAL	39,500 acres	

Of the abovementioned total, about 12,000 acres were irrigated by means of overhead spray equipment which continues to grow in popularity each year.

(a) **Umshandige Irrigation Scheme**

The standard of water management in the Umshandige Valley is still not very high and during this last season there was evidence in many quarters that water, far in excess of the crops' requirements, was being applied. Lands are still uneven in a large number of cases.

Due to the higher prices paid for malting barley by the breweries, this crop was widely grown. Wheat, on the contrary, hardly featured in the cropping programme.

(b) **Umgusa Irrigation Scheme**

There has been a marked swing from vegetable production to dairying and 18 out of the 20 participants in the Scheme are now engaged in whole milk production. All the plots have been taken up and care will have to be exercised in future to ensure that water allocated to settlers is wisely used to the best possible advantage.

(c) **Mazoe Coloured Settlement Scheme**

Settlers have grasped the need for quick irrigation during the summer growing season and have obtained useful maize yields. Vegetable growing continues to be one of the main sources of income bringing in, on the average, a monthly cheque of about £50.

(d) **Sabi Development Farm**

The farmer gained considerable experience in irrigation farming under Sabi Valley conditions during the year, and has settled down well. Maize planted during the summer gave an average yield of 18 bags per acre and did best following lucerne which was ploughed-in.

Each acre of land was irrigated for approximately 8½ hours during the season and received 28 acre inches of water in addition to the natural rainfall of 10.5 inches.

Wheat and barley planted during the winter gave good yields on some lands but the stands were rather uneven on others due to the low seeding rates that were employed. The average yield over the total acreages planted was approximately 6 bags of wheat and 10 bags of barley per acre.

A few acres of onions again proved to be most economical and could be a useful side line on the scheme.

7. SOIL CONSERVATION

(a) **Arabale Areas**

(i) *General.* Good soil conservation practice continues to spread and this is attributable largely to the improved staff position. It is now possible to advise more widely on sound agricultural practices and to follow up and emphasise the importance of the latter. A considerable contribution thereto will also be made by the Farm Planning service now available to farmers which will help to ensure sound land use. There are, however, still far too many farmers whose practices cause serious erosion in spite of mechanical protection works in most cases.

Ridge and furrow layouts in areas with a seasonal high water table have continued to progress and show their value.

(ii) *Mechanical Protection of Arable Land.* Considerable progress was made as the following table shows:—

Region	Period	Contour Ridges & Storm Drains (Miles)	Bench Terraces (Miles)	Irrigation Furrows (Miles)	Pasture Furrows & Veld Ripping (Miles)
Mashonaland	1951/52	2,097	8	4	18
	1952/53	2,907	13	16	8
	1953/54	3,362	15	51	2
	1954/55	2,658	1	62	7
	1955/56	3,312	1	52	1
	1956/57	3,327	2	21	—
Midlands	1951/52	1,215	58	20	29
	1952/53	1,170	90	23	29
	1953/54	853	2	35	1
	1954/55	1,290	3	43	—
	1955/56	1,737	5	33	412
	1956/57	703	13	36	24
Matabeleland	1951/52	157	7	9	30
	1952/53	265	3	36	943
	1953/54	222	6	42	1
	1954/55	220	3	15	—
	1955/56	104	12	11	14
	1956/57	158	1	11	—
Eastern	1951/52	1,164	33	3	6
	1952/53	1,156	15	24	8
	1953/54	1,334	10	27	—
	1954/55	1,792	3	33	8
	1955/56	1,555	12	39	2
	1956/57	1,558	10	56	2
Totals	1951/52	4,633	106	36	83
	1952/53	5,498	121	99	988
	1953/54	5,771	23	155	4
	1954/55	5,960	10	153	15
	1955/56	5,708	30	135	427
	1956/57	5,746	26	124	26

As is revealed by these figures the output of work was high. A further 12 Conservation Assistants (African Peggers) were appointed during the year and they have freed Conservation Officers in areas of high pressure for other urgent duties, and in some areas the backlog of work has thus been wiped out.

(iii) *Roads and Railways.* Erosion caused by roads is still a major problem, although a decreasing one. Farmers, Road Councils and the Southern Rhodesia Roads Division are becoming more and more conscious of their responsibility in this regard and in many instances are co-operating readily with Intensive Conservation Area Committees and this Department.

Narrow, deep and long storm drains are a problem on main roads and the need is evident for a wider road reserve to provide adequately wide, dished drains and for more frequent points of discharge of storm water.

(iv) *Native Cultivation.* This remains a difficult problem largely due to the farmers' fear of losing their labour if it is tackled firmly. Some Committees have taken up the matter energetically and have had considerable success but a great deal still remains to be done. The use of Conservation Assistants and Rangers has contributed substantially to improvement of the position where they have been used but mechanical protection of the land solves only part of the problem. Better soil and crop management are essential if complete protection is to be achieved.

Streambank cultivation is now only a very minor problem due to the activities of the Natural Resources Board, I.C.A. Committees, Conservation Officers, Rangers and the co-operation of landowners.

(b) **Research**

(i) *Erosion Control—General.* No major changes were made to the experimental programme for the 1956-57 rainy season except that for the first time the soil and water losses from the main experiments were measured after each storm instead of on an annual basis.

The 1956-57 season was a fairly normal one, not of high erosive action, but interesting results were obtained particularly on the sandveld experiments. Erosion on the red soils was relatively light.

Series I. Experiments and Main Site. No changes or additions were made to the field experiments of Series I.

The laboratories were completed and gravimetric determinations of the eroded soils were carried out, allowing measurement to be made on a storm or daily basis. Approximately 1,250 determinations were made from all series.

Series II. The transfer of the hybrid maize breeding programme from Henderson allowed the use of commercial maize for the first time, but the season was too low in erosive action for any new results to emerge.

A well, pump and storage tank were built and reticulation to all experiments was completed.

Series III and IV. The same treatments were continued on all experiments and as the first year indications were confirmed, those plots under various tobacco treatments were planted to grass for use in "length of ley" experiments.

On Series IV an electrified security fence was erected and was successful in keeping out baboons. On Series III two cottages were built for African Assistants and a well and pump were installed to supply water both to the cottages and the experiments.

The area surrounding the experiments was cleared and planted to lawn, cattle grids were built and avenues of trees were planted. Site development is now complete except for the installation of water on Series IV where a satisfactory well site has not yet been found.

Field Scale Experiments. The recording apparatus was installed for the field scale 10 acre stubble mulching trial. Run-off was so low from all treatments of this experiment that no conclusions can yet be drawn. Yields were disappointingly low due to an uneven stand, but this should be overcome now that a suitable planter can be used.

Additional Projects. No further work has been done on the proposed laboratory projects such as infiltration, erodibility of soils types, etc., due to inadequate staff for such work.

After discussion with Chemistry Branch a procedure has been worked out for the chemical analysis of the eroded soils, some of which will be done in the Chemistry laboratories and some in the Erosion laboratories. This scheme of chemical analysis will go into full operation during the 1957-58 season.

During the winter of 1957 a start was made on the installation of lysimeters as this section's contribution to a joint project on evapotranspiration, operated jointly by this Department, the Department of Meteorological Services, the Department of Research and Specialist Services and the University College of Rhodesia and Nyasaland. The site has been ploughed, fenced, a new meteorological station has been erected and the crop treatments will be applied during the 1957-58 season.

Summary of Results

1. The season was slightly above average in total amount of rainfall (38 inches) but only twice were there storms of more than two inches per hour intensity. All soil losses therefore were relatively low.

2. Although for the first time the soil and water losses were recorded after each storm, the number of erosive storms was so low that there is not yet sufficient data to make an analysis of the relative erosive powers of different types.

3. No new information has arisen from the red soil experiments this year, but previous results were confirmed. Cover is the chief factor controlling erosion on the red soils. In the mosquito gauze experiments to show the importance of cover, the gauzed plot (complete cover) has now lost a total of under four tons per acre of soil in four seasons, while the bare plot alongside has lost over 400 tons per acre during the same period. The highly fertilized, trashed, continuous maize plot was again highly successful with a yield of over 35 bags for the fourth successive season, and a reasonably low soil and water loss (approximately one ton per acre and one inch of run-off respectively) compared with that of the medium yielding maize plot which lost approximately 15 tons of soil and six inches of run-off per acre.

4. Additional plots were installed last year to determine the relative proportions of the effects of high population and surface mulching, where the combination of the two showed a very great reduction in run-off. It appears that both these factors separately reduce run-off but it is only when the two are combined that the full effect is seen.

The proportional effects are approximately:—

	Run-off — inches
Low population — no mulch	10
Low population — with mulch	5
High population — no mulch	4
High population — with mulch	1

5. The main observations on the sandveld are:—

(a) Erosion increases rapidly after the first year from virgin under all arable crops. The old belief that no erosion takes place in the first year is quite erroneous.

(b) Cover is not as important on sandy soils as it is on red soil.

(c) Slope is much more important on sandy soils than it is on red soils.

(d) As slopes approach the order of 7-8 per cent. no treatment of arable crops can control erosion except for very short periods.

(e) Erosion under tobacco crops can be reduced by—

(1) early planting;

(2) good stands; and by having

(3) rows that run at an angle to the contours instead of straight up and down the slope.

(ii) *Water Table Control.* The need for research into the control of the water table of vlei lands, which constitute some 30 per cent. of the arable land in the higher rainfall areas, becomes daily more urgent as the pressure to use this land for crop production increases, but difficulty is being experienced in obtaining a research engineer for this and for investigation into the methods of controlling the seasonally high water table in the Midlands.

(iii) *General.* There is also a great need for investigational work to be done in soil tillage and treatment, in implements for various purposes and in several other agricultural fields.

(c) **Grazing Areas**

(i) *General Management.* Due to the widespread dissemination of propaganda through the medium of Farmers' Days, the press and visits by the field staff of this Department, the general standard of veld management has been rising steadily — especially in the more progressive areas. Most farmers are fully aware of the need for the provision of rest periods for their veld but all too many still have an incorrect appreciation of its true carrying capacity and are inclined to stock far more heavily than they should do. The importance of adopting a conservative stocking rate (especially in the low rainfall areas) cannot be over emphasized.

(ii) *Mechanical Protection.* Gully control work has continued, but due to lack of funds is being drastically curtailed. On the mopani soils, particularly in the Midlands, gully erosion is a major problem and in certain denuded areas sheet erosion is a hazard. Ripping in some cases has produced good results. Field trials are being undertaken on the mopani soils in order to develop economic control and reclamation measures.

(iii) *Veld Fires.* Except in Matabeleland and the Melsetter area of the Eastern District, uncontrolled veld fires were extremely widespread in Southern Rhodesia during the dry season of 1957. In Mashonaland they were more severe than they have been for many years and took a great toll — not only of the veld but also of human lives.

Co-operative endeavour on the part of I.C.A. Committees and farmers and ranchers generally in Matabeleland in controlling veld fires has been remarkably successful and undoubtedly constitutes the solution to this urgent problem.

(iv) *Bush Encroachment.* Systematic burning of veld at the time that the sap has started to rise in invading woody species (coupled with correct grazing management) is by far the most economical method of controlling the encroachment of bush in grazing areas and is pursued as a matter of policy by many progressive landowners. The total area involved, however, is so vast in relation to the rural population that the problem is very far from being under control.

New chemical preparations, of which there are very many, offer an alternative means of control as does eradication by hand, but the former method is expensive and the latter is both laborious and costly.

Lantana camara has continued to spread in the Eastern Districts generally, although the survey report regarding this bramble indicated that its encroachment could not be regarded as severe. Stoebe vulgaris (Slangbos or Hunya) is invading overgrazed and badly managed disturbed areas in the Inyanga Highlands and, to the south at Chipinga, gauva encroachment continues but does not yet constitute a problem.

(v) *Pastures and Fodder Production.* Acreages under improved pastures for rotational purposes, feed and seed increased rapidly during the year and in the Eastern Districts more silage was made from planted pasture grasses than ever before - despite the disappointing results that were revealed by research into this matter. Seed production from grasses such as Bambatsi Panicum (Panicum coloratum var. makarikariensis), Weeping Love Grass (Eragrostis curvula) and Katambora Rhodes (Chloris gayana) has shown a marked upward trend in Mashonaland and Manicaland due not only to the greater demand but also to an improvement in planting technique.

Oats has preserved its popularity as a green winter feed and is still in wider use than Rhonpha grass for this purpose in many parts of the country. A survey that was recently conducted of the latter hybrid grass revealed that there were many conflicting opinions regarding its usefulness but a general concurrence in the belief that it was rather unpalatable to stock.

In spite of the doubtful economics attending its production a considerable amount of veld hay was made during this last season in the higher rainfall areas under conditions that were almost ideal. A few farmers improved this low quality roughage by the addition of urea and molasses.

(vi) *Fencing.* A great deal of fencing was done during the year under review and in a large number of cases (especially in the lower rainfall areas) accounted for a fairly substantial part of the

farmer's annual expenditure. High tension steel wire retains its popularity in areas where wild game is plentiful.

8. WATER CONSERVATION

(a) Dams Built Under the Guidance of the Department of Conservation and Extension

There has again been a small decline in the number of dams built due no doubt to the succession of good rainy seasons that the country has experienced and to the closing down of further I.C.A. Committee units that has taken place. The necessity of ensuring good water supplies for the drought periods which inevitably will recur cannot be too strongly emphasized.

Table A below gives an analysis of all dams built and shows that, except for the Mashonaland Region, the average size of dam built is well above the average for previous years.

TABLE A

Region	Period	No. of Dams	Aggregate Capacity Gallons	Average Capacity per Dam gallons
Mashonaland	1951/52	199	1,468,700,000	7,370,000
	1952/53	134	909,000,000	6,770,000
	1953/54	172	976,000,000	5,680,000
	1954/55	138	975,140,000	7,066,000
	1955/56	80	621,300,000	7,766,000
	1956/57	72	399,020,000	5,542,000
Midlands	1951/52	322	848,000,000	2,640,000
	1952/53	132	462,610,000	3,500,000
	1953/54	113	648,000,000	5,720,000
	1954/55	101	388,670,000	3,848,000
	1955/56	95	464,705,000	4,892,000
	1956/57	77	781,850,000	10,284,000
Matabeleland	1951/52	225	609,200,000	2,710,000
	1952/53	137	556,850,000	4,070,000
	1953/54	193	911,600,000	4,720,000
	1954/55	137	649,680,000	4,820,000
	1955/56	153	527,300,000	3,450,000
	1956/57	142	679,200,000	4,783,000
Eastern	1951/52	92	350,000,000	3,810,000
	1952/53	62	329,000,000	5,300,000
	1953/54	57	56,000,000	1,000,000
	1954/55	34	149,460,000	4,395,000
	1955/56	25	34,700,000	1,388,000
	1956/57	20	100,565,000	5,028,000
Totals	1951/52	828	3,276,000,000	3,900,000
	1952/53	465	2,257,460,000	4,850,000
	1953/54	535	2,591,600,000	4,840,000
	1954/55	410	2,162,950,000	5,275,000
	1955/56	353	1,648,005,000	4,680,000
	1956/57	311	1,960,635,000	6,304,000

The dams built by farmers, I.C.A. Committees and Government Units are analysed in Table B below. The further decline in I.C.A. Committee units is reflected in the comparatively small number of dams constructed by them. The large number of dams built by farmer-initiative is most gratifying.

TABLE B

Year	Farmers		I.C.A. Committee Units		Government Units		Total No.
	No.	%	No.	%	No.	%	
1951/52	180	21·5	415	49·5	243	29·0	838
1952/53	126	27·0	208	45·0	131	28·0	465
1953/54	194	36·5	234	44·0	102	19·5	530
1954/55	149	36·0	167	41·0	94	23·0	410
1955/56	130	36·0	84	23·8	139	39·3	353
1956/57	146	46·9	50	16·1	115	37·0	311

(b) Catchment Schemes

(i) *Bembesi-Inkwekwesi.* Preliminary investigations were instituted during the year from which it was learnt that the major type of erosion in this area was rather peculiar due to the nature and shallowness of the soil. Detailed investigations of this catchment will be made as soon as the aerial photographs of that particular part of Matabeleland become available.

(ii) *Umzingwane.* Good progress was made in the sphere of dam construction, 34 of these structures having been built during the year. Erosion control research work on grazing land was planned and the necessary installation of equipment and weir construction will be undertaken shortly.

(iii) *Kyle.* Some arable land protection and gully control work was done during the year in the Chatsworth and Victoria Central Intensive Conservation Areas which form part of the catchment, but a great deal more requires to be accomplished in the former I.C.A. and a reconnaissance flight over it was undertaken with this object in view.

(iv) *Sebakwe.* Other than the construction of a number of dams by a large estate and the reclamation of one old road gully, no additional work was done in this catchment during the period under review by the landowners themselves.

The Department of Conservation and Extension, however, initiated some interesting experimental work on mopani soil in the Rhodesdale section of the catchment in the shape of certain gully control dams and sponge protection through fencing. Fertilizer and gypsum were applied to a typical area of mopani soil in the hope of improving the grass cover but the effects of this application and the gully control dams have not yet become apparent. Fencing of sponges done the previous year in this area was extremely beneficial in its effect.

(v) *Gwenora.* Considerable work was done during the year by farmers in this catchment in the protection of their arable lands against erosion. One Order under section 26 of the Natural Resources Act had to be issued.

(vi) *Sabi.* The great progress achieved by the Sabi Catchment Planning Team which was established at the end of July, 1957, is described under (b) of section 11 of this report and will not be recapitulated here. Suffice to state that farmers, I.C.A. Committees and other public organizations in the catchment have given this Department every help in launching the tremendous programme to plan every farm in this vast area.

The efforts of the Department of African Agriculture, which is now engaged in a soil protection drive in the African occupied areas of the catchment, in conjunction with those being made by this Department, will indubitably transform this particular part of Rhodesia into its former unravished state—given time.

(vii) *Umwindsi.* With the exception of one dam of 20,000,000 gallons which was built during the period under review, no further work was done in the Umwindsi catchment due to objections by urban dwellers. The Umwindsi Catchment Protection Committee is to issue its report shortly.

(viii) *Cashel.* The last two remaining jobs under the Cashel Catchment Scheme were done during the year — thus bringing to a close a project which commenced in May, 1951.

(ix) *Tanganda.* This particular catchment scheme has been completed and the area concerned is already responding to the strategic fencing that has been done there.

(x) *Other.* Considerable progress has been made in the fencing in of the Inyazure and Tsungwesi river sources and head waters in co-operation with the Department of African Agriculture.

(c) Vleis and Sponges

Except in the case of Matabeleland a very real response to the protection of sponges and vleis from overtrampling and cultivation has made itself apparent and the position generally in this regard can be considered a very satisfactory one. In the Midlands and Eastern Regions more and more early tobacco is grown in the peripheral areas of vleis each year — invariably after consultation with this Department, but sometimes without the local Conservation Officer's knowledge. A close watch is being kept on this development.

There is no doubt that the effective utilization of vleis constitutes a problem of no mean proportions the solution to which will be found neither easily nor quickly. The drainage trials that have been done at Somabula have pointed the way but true progress in this direction will be made only after a specialist is appointed to concentrate on this work.

9. SURVEY OF MECHANICAL UNITS

(a) I.C.A. Units

Only five I.C.A. Committee owned and operated units remain and one of these will shortly cease work. Those remaining in the field perform a most useful function and their continued operation should be encouraged. In general they show a higher output of productive hours and less time lost due to breakdowns and moving than Government units in Southern Rhodesia.

(b) Government Units (Southern Rhodesia)

These units have generally given considerable trouble due to their age and the severity of the work done by them, and some of them are due to be replaced shortly by more powerful and sturdier machines. In addition, considerable time was lost during the year due to lengthy delays in repairs and overhauls.

The new machines will give better service than the old because of greater power and robustness.

In the past, considerable productivity was lost in the wet season because of lack of work. During the year a reduced movement charge was introduced as a trial for bush clearing during the wet season and this resulted in some 700 hours more work being done than during the equivalent

period of the previous year — a well worthwhile result as it substantially reduced overhead costs per hour.

A large bush clearing job has been undertaken at Triangle Sugar Estates. Three machines are now at work there and a further two will be dispatched shortly.

An analysis of the operating efficiency of the Government operated units is given below:—

	Government Units		
	1954/55	1955/56	1956/57
TOTAL HOURS			
Average Tractor Hours Per Month	239	252·3	242·3
Percentage	100	100	100
PRODUCTIVE HOURS (including servicing)			
Average Hours Per Month	122·8	130·6	128·4
Percentage	51·2	51·5	53·0
Time Spent Moving Per Month	14·5	13·2	18·0
Percentage	6·0	5·3	7·4
Time Lost due to Breakdowns Per Month	38·1	39·6	51·9
Percentage	15·8	15·8	21·4
Time Lost due to Other Causes Per Month	44·6	68·9	44·0
Percentage	27	27·4	18·2

10. FIELD TRIALS

A great many field trials were again undertaken during the year by members of this Department working in close co-operation with the staff of the Department of Research and Specialist Services. That these particular investigations have proved of interest to members of the farming community there is not the slightest doubt and it is gratifying to be able to record that in many I.C.A.s they have stimulated discussion and constituted "talking points" at Farmers' Days and at meetings of Farmers' Associations and I.C.A. Committees.

Not all of the trials that have been done can be accorded scientific recognition in that a large percentage of them were laid out as demonstrations rather than as trials. By being kept as simple as possible these served their purpose admirably in high lighting particular aspects of crop husbandry — such as the desirability of top dressing maize at six weeks in order to obtain high yields.

Some of the trials have definitely been inconclusive. For example, those that dealt with the effect of the presence and absence of trace elements on crop yields have failed to give any information of significance despite the fact that great care was exercised in carrying them out. They will be repeated during the 1957-58 season.

A list of all the trials that were established and supervised by officers of this Department during the 12 months ended the 30th September, 1957, are given in the following table:—

FIELD TRIALS, 1956/57

Region	Trace Elements on Legumes	NPK Presence and Absence	Stubble Mulch	Population Fertilizer	Fertilizer Placement	District Maize Varieties	Drainage Trials	Cotton Varieties	Mopani Gully Control	Bush Encroachment	Tobacco Trials
Eastern	3	nil	2	15	1	2	nil	1	nil	nil	nil
Midlands	nil	4	3	9	nil	3	2	1	3	3	5
Mashonaland	2	5	1	6	nil	3	nil	nil	nil	nil	nil
Matabeleland	nil	3	nil	3	nil	nil	nil	nil	nil	nil	nil
TOTALS	5	12	6	33	1	8	2	2	3	3	5

11. ADVISORY SERVICES

(a) General

There was an unabating demand on the part of farmers for professional and technical advice on all matters relating to agriculture, and field officers of the Department spent an extremely busy year coping with this particular aspect of their work. In view of the fact that they are also technical advisers to the I.C.A. Committees it can be said with justification that the specialized knowledge at their command was put to very good use in countless different ways. The fund of goodwill to this Department that has been built up over the years in the minds of farmers has, it is considered, been strengthened during the period under review — a fact of great importance to an organization which can function efficiently only if it has the confidence and trust of the rural community.

The close co-operation that has always existed at all levels between the officers of this Department and those of the Department of Research and Specialist Services continued during the year.

As an indication of the diverse nature of the visits paid by officers during the year ended the 30th September, 1957, the following table is submitted:—

VISITS MADE BY OFFICERS OF THE DEPARTMENT

	Eastern Region	Midlands	Matabeleland	Mashonaland	Total
Pegging					
1. Contours	1,032	694	127	2,527	4,380
2. Storm Drains	46	32	61	40	179
3. Grass Strips	10	23	—	86	119
4. Other (Pasture Furrows)	8	104	22	132	266
5. Roads and Drains	66	72	33	175	346
6. Irrigation Works	158	131	121	50	460
7. Dams	190	218	339	356	1,103
TOTAL	1,510	1,274	703	3,366	6,853
Inspections					
1. Subsidy	26	43	64	81	214
2. Water Court	126	77	52	123	378
3. Roads	138	80	8	42	268
4. Timber Cutting	5	30	12	8	55
5. Land Settlement and Crown Land	49	115	33	62	259
6. Sub-division	50	84	83	227	444
7. Seeds	11	46	11	61	129
8. Livestock Improvement	55	154	98	111	418
9. Livestock, Other	57	32	24	119	232
10. Mechanical Units	51	368	312	425	1,156
11. Miscellaneous	326	756	247	915	2,244
TOTAL	894	1,785	944	2,174	5,797
Advisory					
1. Field Crops	1,443	1,057	230	478	3,208
2. Veld and Pasture	66	211	116	133	526
3. Livestock	82	517	276	168	1,043
4. Irrigation	104	199	185	144	632
5. Conservation	615	1,205	422	1,069	3,311
6. Farm Planning	602	1,105	258	1,495	3,460
TOTAL	2,912	4,294	1,487	3,487	12,180
Meetings					
1. I.C.A. and Group	276	486	265	579	1,606
2. Farmers' Associations and Road Council	85	192	54	194	515
3. Staff	128	282	162	397	969
4. Miscellaneous	153	214	54	325	746
TOTAL	642	1,164	535	1,495	3,836
Other Visits					
1. Research Stations	91	103	35	190	419
2. Farmers' Days	68	90	60	174	392
3. With Committees	411	314	242	474	1,441
4. With Specialists	277	126	133	235	771
5. Miscellaneous	987	489	227	1,078	2,691
6. Field Trials	275	532	80	118	1,005
TOTAL	2,019	1,654	777	2,269	6,719
				GRAND TOTAL	35,385

(b) **Farm Planning**

The appointment on the 1st July of a Chief Planning and Training Officer virtually led to the establishment at that date of the Planning Section of the Department and helped to consolidate the start that had been made in this development by the appointment of the Senior Planning Officer in 1956. A great step forward was the completion towards the close of the period covered by this report of a new Planning Wing adjoining the Department's Head Office in Salisbury. The provision of this accommodation resulted in improved working conditions and consequent efficiency on the part of the staff.

A significant outcome of the creation of the Planning Section was the establishment in July of the Sabi River Catchment Planning Team of six officers whose duty it is to plan scientifically and methodically the entire catchment of this particular river in order to help bring to an end the tremendous amount of erosion that has been in progress there for so long. The programme that confronts the Planning Team is a formidable one of long duration. Eight to ten years may see its completion. No time has been lost by the six officers concerned in setting about their task and already a great deal of work has been accomplished in the head of the Catchment where the programme was launched. In two months of field work up to the end of September, coding had been carried out on 13 farms totalling 53,200 acres and it is confidently expected that in the next field working season (1958) the team will complete between 15 and 20 farms per month — a potential of at least one I.C.A. per year, by this little group of men alone.

The Planning Section has developed a technique for producing Preliminary Plans which is based entirely on photo-interpretation. It will enable new areas to be opened up correctly with the

stumping of lands, the laying out of roads and the disposal of water, all taking place on a planned basis. This system will be expanded to establish minor catchment, Intensive Conservation Area and "regional" planning in those parts of the country to which it is particularly well suited and it will take the place of development plans at present required by the Land Settlement Board. It needs to be stressed here that this Preliminary Planning Technique does not replace Whole Farm Planning, but is complementary to it.

Whole Farm Planning proper, as such, developed tremendously during 1957 due primarily to refinements in technique occasioned by the widespread use of aerial photography, but also due to improved in-service training given to officers, by the Planning Section, in the employment of these new aids and methods. Nevertheless, progress was not as rapid in this sphere as had been hoped. Several reasons were responsible for this fact, chief among them were:—

(i) Non-availability of new aerial photography;

(ii) Officers being unsure of themselves and reluctant to ask for assistance;

(iii) Certain I.C.A. Committees not having given the necessary degree of priority to Whole Farm Planning due to the failure of the Conservation Officers concerned to convince them of its importance;

(iv) Difficulties that arose in regard to the reproduction of aerial photographs.

It is pleasing to record that these have now been largely overcome.

The following table gives a good although by no means complete picture of what has been achieved in Whole Farm Planning up to the end of September, 1957.

Region	Total Applications up to 30.9.57	Total Plans Completed up to 30.9.57	%
Mashonaland	323	62	19
Eastern	166	33	20
Midlands	282	110	40
Matabeleland	61	27	44
	832	232	27

The abovementioned figures do not reflect accurately the progress that has been made in that all areas were concentrating, towards the end of the period covered by this report, on the coding and classification of soils in anticipation of the arrival of the rains. It is considered that by the end of December, 1957, 300 new-system plans will have been completed bringing the total number of plans completed on the old and new systems to ± 430 or just over 50 per cent. of the applications.

(c) Farmers' Days

It has for long been the policy of the Department to encourage the holding of as many field days as possible throughout the country in order to help communicate to the rural population at large new ideas and techniques in agriculture and the exchange of information among the farmers themselves. Numerous gatherings of this kind (157 altogether) were held during the year in collaboration with local I.C.A.s and Farmers' Associations and covered practically all aspects of agriculture relevant to Southern Rhodesia. They served a very useful purpose indeed.

(d) Shows

The Department was intimately concerned with the organization of most of the smaller country shows that were held in Southern Rhodesia during the year in that representatives served on the show committees and also played an important part in acting as judges and stewards in the livestock and other sections. Senior officers of the Department also judged at the larger agricultural shows and at all of these functions, both large and small, a Departmental stall was established to help emphasize some particular principle of good husbandry.

From a strictly agricultural viewpoint some of the rural shows were rather disappointing in that the standard of the exhibits was not as high as it should have been. It is hoped that the position will be very different in 1958.

(e) Teachers' Courses

A successful Conservation course of six days' duration was held in Gatooma during August. Unfortunately it was not given sufficient advance publicity and the response in consequence was much smaller than usual where numbers were concerned. Another reason for the poor attendance was the choice of venue. Had the course been held in Umtali or Salisbury it would have attracted far more teachers — a fact which will not be forgotten when future courses are to be organized.

Conservation has continued to be taught as a subject at the Heany College for Teachers near Bulawayo, but its importance in the overall scheme of things is emphasized also in an indirect way

by this institution in the lectures that are given to its students on history, geography and natural science.

With the publication and distribution of the book "Conservation — A Guidebook for Teachers", which is at present being printed, a great stride forward will have been taken in the dissemination, among key figures in the community, of general conservation knowledge in an interesting and useful form. This particular book represents an achievement of which its two authors can be justly proud.

(f) **In-Service Training**

The effort over the past year had as its objective the training of all the Department's staff in Farm Planning. This was successfully accomplished and acknowledgment must be made of the fine efforts on the part of the instructors who maintained a high level of interest and instruction over 12 courses. Of two weeks' duration in every case, these courses were held in various centres in Southern Rhodesia (and one in Northern Rhodesia) and were attended not only by officers of this Department, but also by members of other Departments and by officials from neighbouring territories such as Swaziland, Angola and Portuguese East Africa. In all, 178 members of the Department of Conservation and Extension received the benefit of this particular tuition during the year ended 30th September, 1957.

Between courses the Senior Planning Officer and the Pedologist visited all Groups and many Intensive Conservation Areas throughout the country in order to ensure at first hand the maintenance of a high standard in planning.

A further eight officers are being trained on tobacco farms for the duration of the season in order to strengthen the tobacco advisory service of the Department.

All recruits appointed during the year received intensive training for 2-3 months under the guidance of experienced officers, prior to being placed in an I.C.A.

(g) **Agricultural Engineering**

The two officers who are now available to advise on farm machinery, farm buildings and structures respectively, are giving valuable guidance and assistance to farmers, research stations and demonstration farms, but it is abundantly clear that they are falling far short of being able to cope with the great demand for their services.

It has become evident that research is required in land tillage and the suitability of various farm implements for operation under local conditions.

(h) **Young Farmers' Clubs**

Far from acquiring the services of a third Y.F.C. Organizer during the year (which would have satisfied a long-felt want), the absence of one Organizer on long leave left his colleague to cope with the busy months of May to September. This circumstance had a direct and harmful effect on all sections of the movement.

(i) At club level it caused an overall drop in club standards and achievement.

(ii) At Regional level it resulted in confused Regional activities. Mashonaland alone coped reasonably well.

(iii) At National level it necessitated splitting national events and, in consequence, resulted in reduced attendance.

There is no doubt that lack of more Organizers constitutes the biggest single problem that confronts this important organization and that it has resulted in a great feeling of frustration on the part of those most intimately concerned with the well-being and growth of Y.F.C.

Due to a lack of members of Y.F.C. age and adult apathy, the Colleen Bawn School Y.F.C. and the Y.F.C. at Milton Junior School in Bulawayo respectively were forced to close down during the year.

Regional Executive Committees have progressed steadily in Y.F.C. knowledge and ability and deserve a great deal of credit for what many of them have accomplished — especially when it is remembered that all the Committee members are volunteers who receive no financial reward for their services.

12. DEMONSTRATION FARMS

(a) **Karoi Experimental-Demonstration Farm**

Despite the fact that the annual rainfall (24 inches) was on the low side it was well distributed which resulted in the production of reasonably good crops of legumes (Jackbean, ground-nuts and cowpeas) and a particularly good crop of maize. The latter yielded 27.17 bags of grain per acre representing an increase of 7.47 bags per acre over the previous season's results.

Local experience on the farm has proved conclusively that Giant Rhodes is a very much better grass to grow than either Star or Katambora Rhodes in that it produces a greater quantity of leafy material and more valuable aftermath grazing than either of the other two.

All the beef cows (of which there are 20) calved during the year. The herd in general, with the exception of the calves, came through the winter in good condition helped, in large measure in the case of the breeding animals, by the supplementary feeding of maize residues and foggage together with urea and molasses.

The dairy herd of 38 cows produced, during the year, 17,500 gallons of milk much of which was sold to members of the large construction staff at Kariba through Karoi Dairies.

Pigs showed considerable improvement during the period under review and sheep, both Blackhead Persians and Dorpers, continued to thrive.

Overhead spray equipment purchased in July was put into operation shortly afterwards in irrigating a five acre mixed pasture of clover, cocksfoot and fescue and was the subject of much interest on the part of visitors.

This particular farm continues to serve a most useful purpose and has done much to guide farmers in the Karoi area to the solution of practical problems in the spheres of both crop and animal husbandry.

(b) **Chipinga Experimental-Demonstration Farm**

This farm has been replanned this year on the basis of soil profile coding and the completion of the plan awaits the outcome of the costings survey which is at present being analysed by the Branch of Economics.

Irrigated winter pastures were not very successful and are to be tried again in vlei areas during the coming year. Drought conditions did not favour field crops and maize yields dropped from 14 to 10 bags to the acre because of this fact. Irrigated crops were naturally unaffected by the shortage of natural rainfall — peas and beans grown under irrigation for the local canning factory yielding well during the year in rotation with kale and oats.

In the orchard the citrus, as in the past, did considerably better than the deciduous fruit which was rather badly damaged by fruit fly, fruit piercing moth, beetles and birds.

During this year for the first time it was possible to cull female stock from the Friesland dairy herd, the animals concerned being disposed of locally. The herd average for milk production increased to 2.52 gallons per head per day for the whole year and resulted in a total receipt of £1,541 from milk sales. Regular dosing against internal parasites with hexachlorethane, Tetram and N.C.A. was extremely effective, no worm specimens being discovered during any of the regular veterinary inspections that were conducted during the period under review.

This station is visited frequently by farmers in the area (there were between 180 and 200 callers during the year) and like its Karoi counterpart serves an important function in helping the members of the rural community keep abreast of developments in the various fields of agriculture.

(c) **Whole Farm Demonstration Scheme**

Due to the vastly increased emphasis that has been given to farm planning during this last year, the need for the Whole Farm Demonstration Scheme has greatly diminished and can be said almost to have disappeared. In consequence no further applications to participate in the scheme were accepted, but the seven farmers who were already co-operating continued to receive all the guidance and help that the Department could give.

There was one withdrawal from the Scheme during the year. Of the remaining six, two had a successful season, three did moderately well and one had a poor year due to excessive rains. In the majority of cases the interest and guidance of the local advisory committee has resulted in a marked improvement in the standard of farming on the part of the participants.

13. SOUTHERN AFRICAN REGIONAL COMMITTEE FOR CONSERVATION AND UTILIZATION OF SOIL

The Director once again represented the Department at the annual meeting of the Southern African Regional Committee for Conservation and Utilization of the Soil that was held, on this occasion, in Windhoek during the period 29th April, 1957, to 1st May, 1957. It can be said without reservation that the meeting was an outstandingly successful one and that the week's tour of South-West Africa which followed gave the delegates an excellent picture of many of that territory's principal problems and achievements.

NORTHERN RHODESIA

1. ORGANIZATION

This year has seen considerable consolidation in the organization of the Department. The administrative section has been involved in a considerable amount of adjustment, but most of the major items have now been cleared up.

The majority of the staff have now signed Federal terms of Agreement. The Mechanical section, however, due to various difficulties, have still not had their agreement forms finalized.

Close co-operation has been maintained with the various territorial Government Departments. Generous and far-sighted assistance was received from the late Mr. W. Wroth, Member for Agriculture, and G. Lynn, Director of Agriculture, and the necessary posts were made available to enable the Department to build up a powerful Advisory service.

During the year much as done to build up the staff by means of intensive short courses, visits to the Research Stations and leading farmers, and by visits of Specialists from Southern Rhodesia.

(a) **Head Office**

The staffing of this office was not completed until towards the end of the period under review. In particular, there existed grave weaknesses in the Executive and Clerical section due to the fact that the clerical staff were all new recruits with no experience. Until the appointment of the Senior Executive Officer, the supernumerary Higher Executive Officer carried out the duties of that post in an acting capacity. An adequate records system which did not exist previously was brought into being.

The year has been devoted to establishing the basic office organization and training staff and these efforts are now beginning to show results, but much remains to be done before the position can be regarded as satisfactory.

(b) **Group Offices**

All the Group Offices are now functioning as separate units. During the initial stages this decentralization was confusing in that staff continually tried to deal direct with Headquarters in Lusaka, but this has now been overcome. There is, however, a need for clerical assistance at all Group offices and early provision for this is being sought in the estimates for 1958-59 by which time the need will have become acute.

(c) **Intensive Conservation Areas**

There are 23 I.C.A.s at present among which number is included the new Fort Jameson I.C.A. declared during the year. There is also the possibility that the Mumbwa Area may be declared in the near future. Thus the whole of the European area, with the exception of part of the Copperbelt and Abercorn, will be covered by the I.C.A. organization. In order to have better liaison with farmers on the Copperbelt, however, it may be necessary to have I.C.A. sub-committees for the various areas on the Copperbelt.

Boundaries Changed. Monze has been joined to Pemba (Pemba-Monze I.C.A.). Magoye-Monze I.C.A. is now Magoye I.C.A. on its own.

The Lusiti farms previously in the Upper Kaleya I.C.A. have been joined to the Nega Nega I.C.A.

The present I.C.A.s are as follows:—

1. Chingola.
2. Mkushi.
3. North Broken Hill.
4. South Broken Hill.
5. West Chisamba.
6. East Chisamba.
7. Mwomboshi.
8. North Lusaka.
9. West Lusaka.
10. East Lusaka.
11. Chilanga.
12. Nega Nega.
13. Upper Kaleya.
14. Mazabuka.
15. Lower Kaleya.
16. Magoye.
17. Monze-Pemba.
18. Choma North.
19. Choma South.
20. North Kalomo.
21. South Kalomo.
22. Livingstone.
23. Fort Jameson.

In future all agricultural statistical information will be prepared according to Intensive Conservation Areas. A revision of the present I.C.A. gazetted boundaries is now taking place and it will probably be necessary to re-gazette them so that the same method of demarcation for all the I.C.A.s is used.

(d) **I.C.A. Committees**

Due to previous staff shortages, the degree of enthusiasm of the Committees was directly related to whether they had the services of a Conservation Officer or not. This situation has now altered and Conservation Officers are so placed that all Committees and farmers have experienced and trained staff at their disposal. In most areas, Committees are active and field days, demonstrations, quiz evenings and talks with visual aids are becoming an integral part of their activities. A few I.C.A. Committees, however, have stagnated and progress in these areas suffered accordingly. One important aspect of their work which has been neglected is the visiting of farms in their respective areas. Every effort will have to be made in the coming year to encourage this aspect of their work.

The Department is very grateful to all the I.C.A. Committees for the assistance and co-operation that it received during the year, and to the Chairman of the Natural Resources Board for his active and enthusiastic support to committees.

(e) **Group Organization**

At present there are four Group Organizations in operation with probably the Broken Hill-Mkushi Group being formed in the near future.

The Group Committees are most active and serve a very useful purpose in that they are influential and are in a position to deal with matters of conservation policy in large areas.

2. STAFF

(a) **Establishment**

The staff position improved considerably during the year as all vacancies were filled. The following table reflects the position:—

	Authorised 30.9.56	Authorised 30.9.57	Requirements
Assistant Director	1	1	1
Administrative Staff at Head Office (*a*)	9	9	10
Regional Clerical Staff	1	1	1
Regional Conservation and Extension Officer	1	1	1
Additional Regional Conservation and Extension Officer	Nil	1	1
Group Conservation and Extension Officers	5	8	8
Additional Group Conservation and Extension Officers	4	Nil	Nil
Conservation Officers	18	18	19
Senior Conservation Engineer	1	1	1
Senior Animal Husbandry Officer (*b*)	1	1	1
Animal Husbandry Officer (*b*)	1	1	1
Senior Tobacco Extension Officer	1	1	1
Irrigation Extension Officer	1	1	1
Planning Officer	1	1	1
Soil Chemist (*b*)	Nil	1	1
Economist (*c*)	1	1	1
Dairy Officers (*b*)	2	2	3
Horticulturist (*b*)	1	1	1
Farm Superintendents	1	1	1
Farm Managers	5	5	5
Farm Assistants	1	1	2
Agricultural Topographers	2	2	2
Conservation Working Account Staff (*d*)	19	19	19
African Staff	51	51	51
TOTALS	128	129	133

NOTES

(*a*) One Higher Executive Officer (Accounts) seconded from Ministry of Agriculture.
(*b*) Seconded from Department of Research and Specialist Services.
(*c*) Seconded from Ministry of Agriculture.
(*d*) Officers paid from the Working Account.

(b) **Visits to Other Countries**

The Regional Conservation and Extension Officer attended the Fifth Meeting of the S.A.R.C.C.U.S. held in South-West Africa and the visit was very interesting and informative.

The Horticulturist attended a course on Citrus during the year at the Sub-Tropical Research Station, Nelspruit, South Africa.

The Additional Regional Conservation Officer, whilst on leave, paid a short visit to the Kenya Highlands where he examined various aspects of conservation work that was being done there.

(c) **Committees**

Officers served on the following committees during the year:—

(i) Natural Resources Board of Northern Rhodesia—Assistant Director (Advisory).

(ii) Agricultural Lands Board — Assistant Director (Member).

(iii) Livestock Improvement Committee — Senior Animal Husbandry Officer (Chairman).

(iv) Livestock Improvement Board — Senior Animal Husbandry Officer (Member).

(v) Advisory Committee for Fort Jameson Financial Association — Senior Tobacco Extension Officer (representing Ministry of Agriculture).

(vi) The Water Board — Irrigation Officer (Advisory).

(vii) The Copperbelt Special Area Committee — Additional Regional Conservation Officer (Advisory).

(viii) The Copperbelt Lands Advisory Committee — Additional Regional Conservation Officer (Advisory).

(d) **Housing and Offices**

Housing has proved difficult during the whole period under review, but the position will improve once the construction of houses at Kalomo, Monze and Chisamba is complete. The allocation of sites at Chisamba, due to uncertainty of the township area, has delayed building. In Lusaka, makeshift arrangements have had to be resorted to and despite the acquisition of five new houses — one of which is rented — the Department is still short of accommodation for officers.

Application has been made for a further three housing entitlements which, it is hoped, will be provided reasonably soon.

Reasonable office accommodation has been obtained in all centres except Lusaka where the offices are overcrowded. Additional offices will be allocated to the Department in Lusaka in December, 1958, and until then many officers have to share offices. This is undesirable as it tends to reduce efficiency.

The acquisition of furniture for the Copperbelt houses has not worked out satisfactorily. Amongst other problems is the storage during leave of private furniture owned by officers.

3. TRANSPORT

Apart from two officers still using Government transport, all officers are now using their own transport. This system is working satisfactorily although from July, 1957, the mileage allocation per officer was reduced and staff since then have been on a bare minimum. Each Group Officer is responsible for the mileage within his Group.

The total number of miles officers performed on official duty during the year was 363,164.

4. EXPENDITURE

Vote		Item	1956/57 Authorised	1956/57 Actual	1957/58 Authorised and Anticipated Expenditure
39	A	Salaries, Wages and Allowances	69,324	69,009	87,684
	B	Travelling and Subsistence	5,360	6,459	7,340
(a)	C1	Books and Periodicals	—	—	40
	C2	Camping Equipment	500	277	50
	C3	Leave Entitlements	1,869	2,425	1,300
	C4	Office and Miscellaneous	1,680	1,341	1,332
	C5	Purchase and Upkeep of Instruments, office and Technical Furniture and Equipment	2,447	2,630	934
	C6	Recruiting Expenses	1,440	523	100
	C7	Water, Light and Sanitary Charges	210	23	100
	D	Posts and Telegraph Services	789	692	1,330
	E1	Chalimbana Experimental Farm	5,820	6,790	5,610
	E2	Kambowa Experimental Farm	14,182	5,643	7,050
	E3	Mochipapa Experimental Farm	5,365	5,444	5,800
	E4	Msekera Experimental Farm	7,336	7,212	5,575
	F1	Conservation Working Account — Borehole and Engine for Workshops	750	635	—
	F2	Conservation Working Account — Increase of Working Capital	10,000	10,000	35,000
	F3	Purchase of Capital Assets	—	2,468	3,500
	G	Conservation Works and Measures and Field Trials	2,942	2,442	1,500
	H	Transport and Equipment	26,105	21,038	23,570
(b)	J1	Good Cattle Production Bounty	35,000	37,682	—
(b)	J2	Livestock Improvement Scheme	7,000	6,998	—
(b)	J3	Milk, butter and Good Farm Subsidy	75,000	97,750	—
(b)	J4	Regional Conservation Committees	50,000	Nil	—
(b)	J5	Tobacco Fertilizer Transport Subsidy	6,000	3,985	—
(b)	J6	Wheat Subsidy	3,000	Nil	—
	K	Erection of Houses and Other Buildings	63,000	51,774	18,000
	L	Transfer Adjustments	1	2,350	1
(b)	M	Guaranteed Loan Repayments Land and Agricultural Bank of Northern Rhodesia		34,935	—
		TOTAL	£395,020	£380,525	£205,816

(a) Previously provided on Agriculture General Vote.
(b) Now provided on Agriculture General Vote.

5. AGRICULTURAL CONDITIONS

(1) Climate

All areas experienced early November rains which set in until the middle of December. This was followed later on by a dry period especially in the southern area where a severe five weeks' drought took place. In the Central and Eastern Provinces minor dry spells followed from the end of December until January. In the Southern Province the total rainfall was below average 20-30 in., while in the Central and Eastern Provinces the total rainfall was above normal, varying from 30-50 in. The rains generally ended earlier than usual this year.

During the summer, temperatures were well above the average, but normal for the winter with very little frost.

The incidence of hail in all areas was well above normal and resulted in considerable damage being caused in some parts.

(2) Crops

(i) *Maize.* Despite the uneven distribution of rainfall and the early cessation of the rain, the European maize crop this year is estimated to be about 1¼ million bags. The yield per acre is

estimated at 10.2 bags for the country, which shows a general all round improvement in cultural methods and can be regarded as the outcome, also, of the incorporation of crop residues into the soil and higher and more accurate fertilizer applications.

A big improvement has been noticed in the plant populations achieved; the need for good stands, it should be mentioned, has been continuously stressed by the Conservation staff during the year. A farmer in the Mazabuka area averaged 30 bags per acre over nearly 500 acres. The production of maize on the sandveld areas continued to be of a high standard comparable to anywhere in the Federation. The present trend is towards decreased acreages and higher yields.

The incidence of disease this year was not as troublesome as last year, probably due to the rains ending early. Cutworm was troublesome during the early stages of the growth of the maize.

(ii) *Tobacco.* In the year under review considerable progress has been achieved in the tobacco areas of the Territory. Despite inadequate barn accommodation and handling difficulties the crop still turned out to be one of the best ever sold. Of the 267 farmers who planted tobacco, 256 grew flue-cured and of the latter nine planted Turkish tobacco. There were seven farmers in the Fort Jameson area who planted only Burley tobacco and four farmers in the Territory who grew only Turkish during the period covered by this report.

(a) *Flue-cured Tobacco.* Seedbeds were generally sown during the first three weeks of September but could well have been started two weeks earlier. The incidence of Anthracnose in seedbeds was sufficiently high to be fairly serious but it was far less severe than in previous years. Grass mulching was almost universally applied. The level of management was better than in the past but still left a great deal of room for improvement.

The standard of land selection, layout and preparation also improved in general but ploughing was still too shallow. Very little second year tobacco land was used, new lands being opened up on every farm with acreages supplemented by the employment of reverted fallow lands.

About ten per cent. of the crop was planted with water prior to the rains which commenced generally in early November. By mid-December 90 per cent. and 70 per cent. of the crop had been planted in north-western and north-eastern Rhodesia respectively.

Fertilizing practices along the lines recommended by the Tobacco Research Board were followed by practically every grower. A number, however, applied dangerously high levels of Nitrogen.

Field cultivation generally was well done but topping and suckering practices were still delayed too long after the ten per cent. in-flower guide. This was largely attributable to the uneven stands on most tobacco farms caused by the continuously dull and wet weather from early November to mid-December and aggravated by the use of seedlings in various stages of growth.

Due to the widespread use of insecticides insect infestration was small except in the case of eelworm, an enormous population of which developed in consequence of the early and prolonged rains that fell. Practically all the known diseases were observed, the most serious of which were angular leafspot in the Broken Hill area and alternaria in the Choma to Zimba and the Fort Jameson area. Frogeye disease was general throughout the territory.

The bulking and grading shed facilities on most farms are inadequate. However, most growers baled their tobacco for dispatch to the commercial grading sheds which handled 65 to 70 per cent. of the territory's crop. Curing barns are insufficient on most farms for the acreages planted with the result that tobacco curing suffered unnecessarily. Generally, barns were packed too tightly and leaves were reaped too green for fear of field diseases. As a result barnspot and barnrot became more severe than otherwise would have been the case. Conditioning and presentation were satisfactory for sale purpose except in the case of Fort Jameson tobacco which was generally too dry in condition. This can be appreciated when the distances involved are remembered. The handling of crops in the territory generally must still improve considerably.

(b) *Turkish Tobacco.* It was a poor year for Turkish tobacco and the interest shown by farmers last year in this crop did not manifest itself in the field. No statistical data are available but it would seem that the Samsoun variety was grown more widely than the Soulouk variety. Diseases were severe and yields were generally poor although prices were good on the whole. It was unfortunate that Samsoun seed obtained from one of the agents distributing seed in the territory was contaminated with Flue-cured tobacco seed. This resulted in some of the crops being ploughed in. Few farmers are interested in this crop.

(c) *Burley Tobacco.* Burley was planted only in the Fort Jameson area and was grown mainly by African tenants. Yields were very low but selling prices were unexpectedly high. It is proposed to carry out an extensive series of Burley tobacco experiments at the Msekera Demonstration Farm in Fort Jameson during the coming season and six field trials, each

of one acre and comprising two varieties will be conducted in the heavy textured soils of the Mazabuka, Lusaka and Chisamba areas during the 1957-58 season.

(iii) *Wheat.* Apart from a few farmers who are growing more than 50 acres, wheat is grown only in small isolated patches. Experiments on wheat growing are being carried out on the polder scheme which have proved most encouraging. Yields varied from about 6 to 12 bags per acre.

(iv) *Ground-nuts.* Apart from small acreages grown for farm consumption by African labour, ground-nut production is almost nil. The Eastern Province produces almost the entire crop of this commodity.

(v) *Potatoes.* Blight has continued to affect potato production, and periods of potato shortages took place during the year. The dry season crop is also suffering from the effects of blight, but some growers have done well and have produced up to 120 bags/acre.

(vi) *Beans.* An increase in the cowpea and velvet bean crop for hay and silage took place during the year.

(vii) *Lucerne.* A few dairy farmers grow about ten acres each, but generally the acreages involved are smaller than this. Lucerne when treated properly and grown under irrigation, does respond and should be grown on a larger scale.

(viii) *Vegetables.* The Lusaka district is the main vegetable producing area in Northern Rhodesia, but supplies dwindle during the rains. The large producers export a considerable quantity to the Copperbelt each year.

Production on the Copperbelt is limited entirely to the dry season. The continuous heavy rains, together with a very high incidence of pests and diseases, make wet season vegetable growing an extremely difficult undertaking.

Production from the Broken Hill area is limited mainly to truck crops such as potatoes and onions, fairly large quantities of which were grown this year.

(ix) *Citrus and Sub-Tropical Fruit.* Plantings of citrus are increasing mainly in the Lusaka area, and interest on the Copperbelt is slowly but steadily developing. The quality of fruit leaves much room for improvement.

Production of sub-tropical fruits is limited to small quantities per farm although Northern Rhodesia does offer ideal conditions in the frost free areas.

The marketing of fruit and vegetables is still in a chaotic state and improvement is necessary all round. Farmers must improve the grading and packing of their products in order to present these in a more attractive manner and to facilitate handling. There is also a need for properly equipped storage and disposal facilities through the dealers in order to improve marketing.

(x) *Grass Pastures.* Every effort is being made to encourage the planting of pastures and slowly but surely grass pastures are becoming evident on the farms. Grass seed production is also being tried out on some farms and one farmer near Lusaka, with his first effort, reaped 150 lb. of seed/acre from six acres.

(xi) *Seed Production.* As a result of a visit by Mr. C. G. Tracey and Mr. Kerr from Southern Rhodesia, a Flower and Vegetable Seed Growers' Association is about to be formed in Northern Rhodesia. However, owing to a complete lack of knowledge and experience in this field, planting for the first season or two must be limited to small scale trials. Provided it is handled correctly, this promises to be a useful new farming industry for this country.

(xii) *Stock Feed.* Although many farmers produce large quantities of feed, such as hay and silage, there is still not an adequate supply for the dry winter months. With the development of irrigation schemes some land is being utilized for pastures and lucerne production.

The acreage under grass leys is increasing and will be valuable for hay, silage, and foggage. Dahl is also being tried in several areas and might be very useful during the winter months for beef cattle.

(3) **Livestock**

(i) *Beef Cattle.* The over production of maize has caused farmers to consider other lines of production and many are now establishing beef herds in order to stabilize and diversify their agriculture.

The Cattle Loan Scheme of the Northern Rhodesia Government has supplied some 236 farmers with a small breeding herd of 25 to 50 cows purchased in Southern Rhodesia. Many of these newly established herds are still too small to be economic units, and a further 5,000 head will be required to bring them up to a reasonable size.

Suitable beef bulls are in short supply and farmers with good type breeding herds are in consequence being encouraged to rear a few select ranch bulls.

(ii) *Dairy Cattle.* The number of dairy cattle is increasing and 291 head were imported from the Union of South Africa during the year under review. But for the recent Foot and

Mouth outbreak in the Union of South Africa an additional 800 head would have been imported during that period.

The sales of whole milk to the Co-operative Creameries of Northern Rhodesia during the period September, 1955 to August, 1956 were 1,356,385 gallons and from September, 1956 to August, 1957 a total of 1,859,688 gallons.

The number of suppliers to the Creameries is now 173 and, in addition, there are approximately 20 producer-retailers.

During the latter half of the year, milk tests were carried out on the milk as it arrived at the Creameries and the farmers were notified of the results. It is hoped to be able to introduce a system of payment for milk on a quality basis, and farmers have been given time in which to set their houses in order before the new scheme is introduced. Unfortunately, due to the absence on leave of one Dairy Officer, the "follow-up" advisory visits made in connection with the milk testing were not as comprehensive as should have been the case.

Ways and means of reducing the costs of milk production are being sought by the farmers but generally very little reduction in the present level of concentrate feeding can be made until greater amounts of higher quality silage and hay are conserved for the winter period.

The practice of drastically reducing the level of concentrate feeding during the summer period, when the cows are grazing upon veld, has also been discouraged with a consequent improvement in both the production and condition of the dairy cows.

A few farmers have put down small areas of lucerne or grass/clover mixtures under irrigation in order to obtain green feed during the winter. These plots are being watched with interest by other farmers.

(iii) *Pigs.* There has been an expansion in pig production and the market will shortly be fully satisfied by the local production. There is now a fairly steady supply of baconers to the Lusaka factory and some first class baconers are being produced.

Deep litter housing is proving successful where it is completely covered but due to the high rainfall during the summer months the open courtyards are not proving successful and producers are being advised to erect fully covered courts. The practice of creep-feeding, coupled with three times per day or ad lib. feeding until the pigs reach 120 lb. liveweight, is becoming more popular.

(iv) *Sheep.* On many farms a small flock of sheep could form a profitable sideline as the country is importing mutton in fairly large quantities. There are very few flocks of sheep and in most areas the presence of vermin makes kraaling by night a necessity.

(v) *Poultry.* There is still a shortage of locally produced dressed poultry and the importation of table birds continues at a fairly high level.

It is possible that during the coming year the bulk of the day-old chicks required will be available locally as there are now five hatcheries in Northern Rhodesia—each of varying size and output. The import quota of 50,000 day-old chicks from the Union of South Africa during 1957 has been taken up.

Advisory visits have been principally concerned with feeding and management and an effort has been made to impress upon producers the need for a reasonable standard of presentation of their products, particularly in the case of dressed poultry.

(vi) *Livestock Improvement Scheme.* As from the 1st January, 1957, the Department, with the guidance and assistance of the Livestock Improvement Committee, has assumed full control of both the Livestock Improvement and Good Cattle Production Bounty Schemes. The Department has also been responsible, in consultation with the Livestock Improvement Committee, for the allocation of Essentiality Certificates for the importation of stock from the Union. The Federal Government has also decided to continue to pay a 25 per cent. rebate on the transport charges incurred when importing approved breeding stock. It is the aim of the Department to see that the conditions relating to these various schemes are complied with. Considerable interest has been shown in better methods of livestock breeding, feeding and management.

In the financial year ending 30th June, 1957, 103 farmers received grants towards the purchase of pedigree male and female stock, amounting to £6,925 11s. 0d.

Number and types of Bulls approved for Grants

	Pedigree	*Grade*	*Total*
Afrikander	60	33	93
Friesland	21	3	24
Jersey	11	—	11
Ayrshire	4	—	4
South Devon	4	—	4
Sussex	3	—	3
Angus	—	1	1
Hereford	6	—	6
Guernsey	3	—	3
Others	—	22	22
	112	59	171

6. PRODUCTION FROM IRRIGATION

With the appointment of an Irrigation Officer for Northern Rhodesia it has been possible to undertake intensive investigations of existing irrigation schemes and also study the general potential. The officer concerned has given valuable guidance to farmers and field officers and has assisted with the development of the polder scheme.

(a) Kafue Pilot Polder

On the Surface Irrigation section, the Department of Conservation and Extension was responsible for all the surveying, design in consultation with the Netherlands Consultants, alterations to design, layout and technical advice. In addition, experimental plots were laid out which should provide valuable data on soil and water relationships and a basis for future work on these clays. Soil conservation machinery completed work at the Polder on the 6th September, 1957.

(b) Large Scale Schemes

Liaison was maintained with the Department of Water Development and Irrigation, and reports on the soils of the Ngwerere and the Kalomo South Schemes and the feasibility of irrigating them were submitted.

(c) Farm Schemes

There is a big demand for designs for sprinkler irrigation layouts in Northern Rhodesia. In general, irrigation work on the farm level is of a straight forward character, the main need being one for better layout design and thus better irrigation efficiency. There is a big irrigation potential that has yet to be developed but there are also many problems waiting to be solved. One of the most important of these is what to advise farmers to grow. The wheat price is not considered an economic one by farmers.

In general, farmers are applying too little water in the hot months of the year. This was especially marked in the growth of potatoes in October and farmers have been advised to increase their application to two inches of water every five days. There is little doubt that the estimates of water requirements as used by the Water Board are completely unrealistic. It is hoped to produce reasonably accurate figures of crop water usage during the next year.

7. CONSERVATION WORKS

(a) Soil Conservation

The figures for the past year as shown in the table below reveal a considerable increase over those for 1955-56, especially in regard to contouring which amounts to approximately three times the previous figure. A large amount of work has been done on various aspects of soil conservation in several of the Groups but considerably more remains to be achieved. Although emphasis is being placed on planning and better land use, mechanical protection of lands must remain a vital aspect of conservation.

Group	Distance in Miles		
	Contours	Storm Drains	Roads
Zambesi	193	1	35
Mazabuka	56	35	5
Lusaka	231	27	10
Copperbelt, Broken Hill and Mkushi	16	11	34
Fort Jameson	23	1	1
1956/57	519	75	85
1955/56	184	40	74

In addition irrigation furrows pegged amounted to 43 miles.

Co-operation is gradually being built up with the Public Works Department on road drainage matters and excellent co-operation is being achieved with the Natural Resources Board. In the latter connection sand and clay quarries in the Copperbelt have been improved and advice has been given on the remedial measures to be taken to control erosion that is taking place in drains that were constructed for anti-malarial purposes.

(b) Water Conservation

A greater number of dams have been built during the past year than during the previous year, most of them in regionally planned areas. Considerable emphasis must still be laid, however, on the need for greater numbers of dams to make available better distributed watering points for stock. The following table shows the number of dams that were built during the period covered by this report.

Group	Farmers		Government Units	
	No.	Capacity (Gallons)	No.	Capacity (Gallons)
Copperbelt and Broken Hill	2	1,500,000	1	1,000,000
Lusaka	2	1,080,000	34	79,906,000
Mazabuka	—	—	11	25,480,000
Zambesi	—	—	—	—
Fort Jameson	6	19,500,000	1	500,000
1956/57	10	22,080,000	47	106,886,000
1955/56	—	—	24	84,000,000

Liaison with the Department of Water Development and Irrigation has been established and is improving.

8. MECHANICAL UNITS

Mechanical units for water and soil conservation are operated by this Department which is responsible for their maintenance, repair, supply, etc. The field staff for the operation of the tractors numbers six, workshop staff for repairs numbers seven, and there is a stores officer who controls and issues all supplies of spares and requirements for all plant. The efficiency of the organization has been rather lower than one would hope for but re-organization and improved methods of control are now showing effective results.

At the beginning of the year under review there were some 20 tractor units. Ten of these have been withdrawn from service and arrangements have been made for their disopsal. The remaining ten are all standardized which should assist towards reducing their running costs. The machines have carried out a variety of work, such as dam building, contour building, road formation and dyke construction and land levelling in the Kafue Pilot Polder Project. A considerable amount of bush clearing was done to provide firebreaks, new arable land and road routes. The purchase of a chain for bush clearing proved most successful in that the costs of clearing were lowered and the strain on tractors was eased.

It has not proved possible for the Senior Conservation Engineer to control effectively the workshops, stores and field organization as well as carry out the advisory services required of him in the civil engineering and conservation field. A Mechanical Engineer will therefore soon be appointed to take control of the machines and both the field and workshops organization.

Both the Chief Conservation Engineer and the Mechanical Engineer from Southern Rhodesia have periodically visited Northern Rhodesia to assist, advise and guide in the running of the tractors. This assistance has proved valuable.

9. ADVISORY SERVICES

(a) Visits

The Specialist Officers in the Department (especially the Animal Husbandry Officer) have, in the majority of cases, visited farms accompanied by the local staff. These visits have been most valuable and have helped the officers concerned considerably.

In-service training of field officers by the specialists is a most important aspect of their work and will receive no little emphasis during the coming year.

The following table will help to indicate the extent of the Department's activity in Northern Rhodesia:—

Groups	Copperbelt and Broken Hill	Lusaka and Chisamba	Mazabuka	Zambesi	Fort Jameson	Total
Meetings—						
1. I.C.A. and Group Committees	38	69	49	44	9	
2. Farmers' Association	22	11	1	10	33	
3. Road Board	3	4	3	14	2	
4. Staff — Groups and Regional	35	39	21	13	2	
5. Visits with Committee Members	35	17	38	2	4	
6. Young Farmers' Clubs	4	—	3	—	—	
7. Miscellaneous	41	16	55	3	12	
	178	156	170	86	62	652
Inspections—						
1. Regional Planning	365	51	60	28	3	
2. Other Conservation Subsidies	19	15	4	6	—	
3. Water Board	38	10	1	2	—	
4. Agricultural Land Board	8	12	10	7	—	
5. Livestock Improvement Scheme	17	74	23	37	—	
6. Cattle Bank	—	—	—	—	—	
7. Dairy Bonus	5	7	—	—	—	
8. Land Bank	1	9	—	8	1	
9. Seed Association	—	2	—	—	—	
10. Tobacco Grading Sheds	—	—	—	25	15	
11. Pest Control	—	—	—	—	—	
12. Miscellaneous	59	90	20	20	25	
	512	270	118	133	44	1,077
Advisory—						
1. Regional Planning	46	137	129	110	11	
2. Farm Planning	20	74	113	113	25	
3. Extension	253	207	125	64	46	
4. Pegging	81	310	238	134	81	
5. With Irrigation Engineer	24	5	17	16	1	
6. Irrigation Layouts	9	50	17	—	7	
7. Mechanical Units	27	72	216	42	—	
8. Experimental Station	48	24	7	6	21	
9. Field Days	12	28	29	17	9	
10. Road Boards, etc.	3	3	10	21	2	
11. Tobacco Advisory	255	26	1	515	519	
12. Miscellaneous	69	96	127	3	43	
	847	1,081	1,029	1,041	765	4,763
TOTALS	1,537	1,507	1,317	1,260	871	6,492

This table indicates that a large proportion of our work has been extension work and shows a considerable increase on last year's figures.

In addition the specialist officers of the Department made 1,610 visits to farmers mainly for advisory purposes.

(b) **Farmers' Days and Demonstrations**

No less than 33 farmers' days and demonstrations were held during the year and, in addition, numerous small tobacco gatherings, quiz evenings, discussions and lectures were organized on various farms.

Specialists from Southern Rhodesia gave a number of lectures and demonstrations on various subjects during the period under review which saw a big increase in the overall number of field days that were held. Enthusiasm for the latter has definitely increased.

(c) **Shows**

Three Shows were held in Northern Rhodesia during the year.

Ndola Show. The exhibit put on was a credit to the Department in view of the limited resources available and the fact that this was the first effort by the Department on the Copperbelt. The main theme was vegetable production and marketing and it was indeed a pleasure to see the effect of good clean handling and packing of vegetables. This aspect of vegetable production on the Copperbelt is a most important point and was well illustrated by the Department's exhibit.

Lusaka Show. The usual last minute rush occurred but out of it all emerged a colourful and attractive display which could not have been missed by anyone. The theme of the display was "Feeding and Management of Livestock", and the general layout was neat and compact. Here again resources were limited and much makeshift work had to be done. A new building had to be erected but in future a more permanent one should be provided for, which will be in keeping with the surrounding modern structures.

Livingstone Show. This show was on a smaller scale than the other two, and the Department's stand was more or less comparable in standard to that of the other exhibits.

Generally, the shows in Northern Rhodesia this year were especially noticeable for the quality and quantity of the livestock that were exhibited. Other lines such as tobacco, maize, fruit, vegetables and poultry were very disappointing.

(d) **In-Service Training**

A Farm Planning course was held in Lusaka for those officers who had not attended this course in Southern Rhodesia and was attended also by six Land Settlement Officers of the Agricultural Lands Board. All officers except the relief officers have now completed the course. After the latter the officers attended a short Fisheries Course at the Game and Tsetse Department, Chilanga.

The Group Conservation Officer, Mazabuka, is working for a season on a well known cattle breeder's farm in Southern Rhodesia in order to improve his practical knowledge of animal husbandry.

All staff visited the Henderson Research Station, Grasslands Experiment Station, Salisbury Experiment Station and the Pig Research Board during the year and the Group Conservation Officer, Fort Jameson, attended a course on Pigs and Pig Carcass Grading in Salisbury for a week.

(e) **Agricultural Lands Board**

Very close liaison was maintained with the Agricultural Lands Board in collaboration with the officials of which numerous subdivisions and inspections were carried out. The following projects have also been completed or are being planned:—

(i) Assisted Settlement Scheme at Mazabuka: Subdivisions for five farms and detailed plans were prepared.

(ii) Mkushi Block: Work is in progress on this Assisted Settlement Scheme which is being subdivided initially into 50 farms; the layout of roads, arable lands and conservation works and the positioning of water supplies are being planned.

(iii) Copperbelt: Mutundu Block A.14: An area of 7,000 acres has been subdivided for future alienation. The future land use policy and the economics of this scheme have been investigated.

Area A.8: The survey has been completed and the write-up is being done.

Kafubu River Farms
Baluba River Farms
Area A.2 Bancroft (Konkola Lots)
} Ground surveys have been completed.

Farm No. 843, Kitwe: Preliminary survey has been completed.

Abercorn Area: A survey will be done when the Mkushi Block has been completed.

(f) **Problems**

The following are some of the major land use problems in the area:—

(i) The flat, badly drained areas in South Broken Hill, Chisamba, Lusaka, Mazabuka and Monze — further investigation is required.

(ii) Minor mineral workings and the effect on the stream banks, especially in the Copperbelt area.

(iii) Rehabilitation of the Lusito area in the Nega Nega I.C.A. — work has commenced.

(iv) Bush encroachment.

(v) Veld fires.

(vi) The economic difficulties being experienced by farmers in the Livingstone area. This matter has been investigated but will need much attention for a time to come.

10. PLANNING

(a) **Regional Planning**

The three year experimental period ended in June, 1957, and the Federal Government is continuing with this scheme.

Eight Regional Plans were prepared and put into operation:—

Upper Kaleya	7,728 acres
Middle Kaleya	57,884 acres
Lower Kaleya	70,124 acres
West Lusaka (Cheta River)	31,121 acres
West Lusaka (Chilongola)	61,008 acres
North Broken Hill	110,161 acres
East Lusaka (Chalimbana)	100,729 acres
Mazabuka Valley	116,987 acres
	555,742 acres

In addition to the above, 10,053 acres were planned in 1952-53 in the Upper Kaleya Pilot Scheme, bringing the total acreage to date to 565,795 acres.

Plans being prepared this year consist of the following:—

(i) Kalomo North (Mukwela Block) of 40,500 acres, has been recommended by the Natural Resources Board and is awaiting the approval of the Minister of Agriculture.

(ii) The South Kalomo Regional Plan has been prepared and will be submitted to the Natural Resources Board for their recommendation.

(iii) The first section of the South Broken Hill Regional Plan has also been prepared and will be sent to the Natural Resources Board for recommendation to the Minister.

Further priorities for planning have been recommended by the Natural Resources Board and these areas will be dealt with during the next year. Progress reports have been submitted in respect of the Upper Kaleya, Middle Kaleya, West Lusaka (Cheta River) and West Lusaka (Chilongola) Plans. These progress reports indicate that a considerable amount of work has been done but there are a number of farmers who, due to various reasons, have not implemented the part of the plan that concerns them. The major items still outstanding are fencing and boreholes. The farmers are, however, making efforts to get this work done, but the period of three years allowed is considered by all to be too short. Extensions of time allowed for these plans have been given and further reports will be submitted shortly to clarify the portion remaining to be done.

During the year a great deal of administrative work was done on Regional Planning and this aspect of the work is now on a sounder basis. Proposals for the future development of planning on a regional basis are being examined and it is possible that alterations to the existing scheme may be made.

A handbook dealing with the general conditions pertaining to the administration of Regional Plans has now been prepared.

(b) **Farm Planning**

To date, little progress has been made in Farm Planning. The time taken on Regional Plans and special Agricultural Lands Board projects has not allowed the officers much time for this work.

All officers have now been trained in Farm Planning and work should progress satisfactorily from now onwards. Investigation has taken place as to the most suitable method of obtaining enlargements, mosaics and reprints of aerial photographs.

11. DEMONSTRATION AND EXPERIMENTAL FARMS

(1) **Kambowa**

Due to possible transfer, this station is being kept only at a maintenance level on the agricultural side and purely for the production of planting material on the horticultural section.

Climate. Total rainfall was 55 inches—some seven inches above normal. A very late rain in May helped fill the dam and revived pastures and legumes which provided good grazing for a longer period. Temperatures were normal, the highest recorded being 89° F.

Animal Husbandry Section. The dairy herd now consists of 21 Jersey type cows and heifers and eight heifer calves. These have been fed silage and concentrates during the dry spell and were run on Star grass pastures during the rains.

Twenty steers were railed from Mochipapa in February and have done very well. Since mid-June they were fed silage and at the moment are in good condition and ready for sale.

Horticultural Section. At the beginning of the year small scale vegetable trials were in operation, but these have been discontinued.

One-quarter acre potato trial was put down using first from imported seed from Scotland. Yields were 6 tons/acre. All development work ceased when it became known that the station was to be moved. The work on the Horticultural Section has been confined to very small observational trials and to the production of plants of all kinds which will be available for transfer to the new station.

(2) **Chalimbana**

This farm was planned during the year to be run as an intensive dairy unit with the utilization of grass leys and irrigated pastures. This policy was not properly established until the plan was completed in June, 1957.

Climate. During the year 30.73 inches of rain were recorded which is about the average for the district. Temperatures were normal and frost incidence was light.

Crops. Thirty acres of Hybrid maize produced 600 bags of maize during the period under review. Five acres of maize and velvet beans were planted for silage and five acres of irrigated oats were grazed by dairy cows for 1½ hours per day.

Twenty acres of Giant Rhodes were planted in January and five acres of Star grass were established.

Livestock (Dairy Section). The herd generally is in good condition after the long dry season but the milk production is low, being just under two gallons per cow per day. Total milk sales for the year amounted to 5,087 gallons which gave a revenue of £845 1s. 3d.

Cows were fed maize and velvet bean silage, dairy meal and have access to 1½ hours of grazing per day on the irrigated oats during the dry season. During the rains they were allowed to graze on veld and pastures.

Pigs. All old stock except two gilts were disposed of and two Large White boars and four Large White gilts have been purchased. Exhibits were awarded prizes at the Lusaka Show.

Sheep. Are to be transferred to Mazabuka.

Future Programme. Implementation of the Farm Plan and the carrying out of trials and demonstrations as approved. Detailed farm costings will be carried out and these figures will be analysed at the end of the year to indicate the profitability of the various enterprises.

(3) **Msekera**

During the year the maize, grasses and other crops did well. The tobacco, however, suffered through too much rain in relation to the amount of sunlight during the early stages of growth (37.48 inches of rain fell during the months of November and May). January and February had cool cloudy weather with little sunshine.

Results of all the experimental work carried out are contained in a separate report but briefly it may be mentioned that tobacco yielded 739 lb. per acre—the low yield being attributed to excessive rain and lack of sunshine. Early planted Burley tobacco yielded 972 lb. per acre and late planted 585 lb. per acre. Hybrid maize yielded 24 bags per acre—no less than 14.7 bags per acre more than the local variety. Eragrostis curvula (mixed Ermelo and Witbank strain) gave 50 lb. per acre of seed over five acres.

Livestock. The policy for beef production is to concentrate on the Angoni breed and 26 head of good stock (some of them rating as excellent) have been obtained as the basis for the herd. The Station participated in the Pig Production Pilot Scheme and 21 weaners were accepted; no losses occurred and profit was estimated at £4 10s. 0d. per head.

The annual field day was held on the 30th January, 1957, and was attended by a total of 64 people. Unfortunately heavy rain washed out the field inspections.

Future policy for the farm will be implemented as per the farm plan and trials and experiments on flue-cured tobacco, burley tobacco, turkish tobacco and maize will be carried out. The management and feeding of pigs will be demonstrated and detailed farm costings will be kept.

(4) **Mochipapa**

The major portion of work on this farm has been the carrying out of tobacco trials and experiments.

Climate. A total of 36.98 inches of rain was recorded during the year but the distribution was uneven especially during January and February when the rainfall was patchy. Temperatures and winds were normal.

The policy of the station is to develop the farm into an intensive tobacco producing unit with beef being run as a side line. The farm has been planned with this policy in view and during the coming season 30 acres of tobacco and 50 acres of maize will be grown and 120 acres of grass and 27 acres of grass/legume pastures will be established.

Experiments will be carried out on NPK fertilizer rates, water planting, eelworm control and variety trials for tobacco, and NPK fertilizer and variety trials on maize. A grass clover trial will also be carried out in the vlei, using Kenya Clover.

The various results of the tobacco experiments are contained in a separate report. In the case of other crops maize yielded 14 bags per acre in the case of that grown for grain and ten tons per acre as silage. Dr. Saunders' cowpeas yielded two tons per acre of good hay.

The pastures of Star, Digitaria milanjiana and Katambora Rhodes yielded good grazing and the Rhodes also gave an excellent hay cut, although seeded in February.

Livestock. The beef herd was culled during the year and now consists of a total of 130 head. Two good Afrikander bulls will be obtained and the herd graded up to Afrikander type. More attention will be paid to the management and feeding of these beef cattle than in the past which will serve a useful purpose in that it will help to demonstrate to farmers in the area these particular aspects of animal husbandry.

The Annual Field Day was held on the 28th February, and was most successful, attracting as it did some 70 people.

CONCLUSION

During the year, which has been difficult in many respects, much has been accomplished in both Southern and Northern Rhodesia, especially in establishing one of the most important and vital services to the Federation, namely "Land-use Planning". The achievements are due to the loyal support and hard work of all the members of my staff to whom I would like to express my sincere thanks and appreciation. In no less manner I am indebted to the I.C.A. Committees of both Territories for their unstinted support and the guidance that they have given to field staff and farmers in our joint effort to improve and establish a land-use pattern on a permanent and stable basis. At the same time I would like to record the grand effort that such a great number of farmers have made in assisting us to implement our programme of work in all its aspects.

I am further most grateful for the help that we have received from the Director of Research and Specialist Services and his staff, the Director and staff of the Tobacco Research Board of Rhodesia and Nyasaland, the Director of Irrigation, Southern Rhodesia, and the Directors of Agriculture, Veterinary Services and Water Development and Irrigation of Northern Rhodesia. Without the co-operation of all these Departments and officials it would not have been possible to perform many of our duties in a satisfactory manner.

The support and guidance received from the Natural Resources Boards of both Southern and Northern Rhodesia are highly valued and I wish to express my sincere appreciation of this help. Similarly I value and appreciate the support received from the Rhodesia National Farmers' Union and the Rhodesia Tobacco Association.

It is our desire not only to maintain our present rate of progress, but to speed it up and increase still further our efficiency in the future. With the help and co-operation of all those mentioned above which I am sure will be forthcoming in the same unselfish manner as in the past, there is no doubt that we will attain this goal.

J. J. DUVENAGE,

Acting Director of Conservation and Extension.

REPORT OF THE DIRECTOR OF VETERINARY SERVICES FOR THE YEAR ENDING 30th SEPTEMBER, 1957

Staff

It is pleasing to record that the Department ended the year with more staff than it has ever had previously, although the establishment was still seven veterinary officers, three animal health inspectors, one meat inspector and one laboratory assistant short. For four of the veterinary officer posts, however, personnel have been selected and within a few months these will be assuming duty.

The additional staff should enable major disease control to be effected on a far better footing than in the past and at the same time permit of more attention being paid to investigation and research and to helping stock-owners with their individual problems of maintaining animal health and securing maximum productivity. The value of lectures and demonstrations to groups of farmers has always been recognized and the increase in staff has made it possible to devote more attention to this important work. Many losses of livestock can be prevented by the practice of proper control measures but unless such measures are constantly reiterated and brought home to the farmers, unnecessary wastefulness continues. The problems confronting our livestock industry are, however, of such magnitude that further increases in staff, particularly specialists and trained technical laboratory staff, will be inevitable if they are to be solved.

Transport

The use of private transport, instead of hired Government transport, has been of very great benefit in providing the all-essential constant mobility of staff in disease control. Operation of private transport at present rates is, however, proving quite uneconomical to those members who have to operate in difficult country.

Tick Borne Diseases and Control

East Coast Fever which has played such havoc with our cattle industry since the beginning of the century appears to have been successfully eliminated the last outbreak, and that only a spasmodic one after six years of freedom, was in March, 1954. But other tick borne diseases continue to take a heavy toll and one closely allied to East Coast Fever, viz.: Theileriosis, although less prevalent during the year must be viewed almost as seriously as East Coast Fever.

With the advent of the many new agents for destroying ticks it was hoped that losses resulting from tick transmitted diseases would diminish at an increasing rate. It is disappointing to record that this is not so and that, due primarily to misuse or abuse of these synthetic acaricides, the tick problem is still a serious one. The Department is doing its best to ensure by propaganda or, where necessary, by applying the law, that the farmers play their part in bringing the problem under reasonable control. The present weapons at our disposal, although still far from perfect, are such that they will achieve a very great measure of success if properly used and we cannot regard their imperfections as justification for accepting a defeatist attitude in the campaign against ticks.

Foot and Mouth Disease

The whole country had been free from this disease for 19 months when it broke out in the Nuanetsi district early in July and a week later in the Nyamandhlovu district. Almost simultaneously outbreaks were reported in the Union of South Africa and the Bechuanaland Protectorate.

Full details of our outbreaks are recorded in the report of the Assistant Director of Veterinary Services (Field) but some general observations are considered necessary.

The Nuanetsi outbreak, although entailing much hard work by staff, presented little difficulty. The area is one in which regular inspections have been maintained for years and infection was detected as soon as it appeared. The usual control measures were immediately put into operation without a hitch, staff, stockowners, police and Native Department officials all being fully familiar with requirements and the outbreak was brought under control in the minimum possible time.

The Nyamandhlovu outbreak, however, presented a very different problem. Although infection had once occurred in the Wankie National Park, in 1940, the subsequent absence of recrudescence of infection in cattle in the vicinity of the game reserve during the following years made it unnecessary to institute and maintain the regular inspection system which experience had shown to be so essential in the Victoria Veterinary District. Thus, when the disease broke out in the Gwaai reserve we had to operate over terrain with which staff was not fully familiar and to deal with officials and African stockowners who had little or no knowledge of what the control measures involved. This resulted in great difficulty as well as delay in getting the initial infection defined and brought under control within cordons. In spite of valiant efforts by all concerned, and here I must pay special tribute to the unsparing energies of Mr. MacKinnon, Assistant Director of Veterinary Services (Field), infection was not contained within its original limits and spreads occurred to the south and east, necessitating movement of the cordon lines and the subjecting of more and more cattle to live virus inoculation. Selection of satisfactory lines along which to operate cordons and create cattle-free breaks proved extremely difficult, not only because of the terrain but also because of the non-co-operative attitude of the African

stockowners, who, as I mentioned earlier, were quite unused to having to comply with the requirements which they regarded as causing unnecessary interference with their methods of livestock raising. When the disease broke through into the northern portion of the Nata reserve, therefore, we had to face up to the possibility of further southward spread occurring, which would prove extremely difficult to prevent extending throughout the rest of the reserve and in fact into the European farms right up to the Plumtree/Bulawayo railway line.

In view of this serious threat and in full realization of the difficulties under which the B.S.A. Police were labouring due to having to operate a cordon with temporarily recruited undisciplined Special African Constables who had little control over the local African stockowners, it was decided to enlist the services of the military to operate a cordon with their regular well-disciplined soldiers of the Second K.A.R. Within a few days of taking this decision the troops moved in and the control position rapidly improved. The full and willing co-operation of the General Officer Commanding, Central African Command, and the speed with which action was taken in moving in his troops is greatly appreciated.

For many years we have been convinced that the Foot and Mouth disease outbreaks in the Fort Victoria lowveld have been the result of game-cattle contacts. This belief was strongly strengthened by the fact that the only other outbreak recorded as a primary outbreak, the 1940 Wankie one, also occurred in cattle kept in close contact with a dense game population. During the present two distinct and completely disassociated outbreaks, one due to S.A.T. I and the other S.A.T. II virus, game has again apparently been the source of infection and lesions of Foot and Mouth disease have been definitely identified in kudu, duiker, wildebeeste, eland and sable in the vicinity.

Only the future will show to what extent the infection in game in the Wankie National Park will necessitate more active control having to be applied in the contiguous cattle raising areas—it may well mean our having to adopt and maintain the same system of short interval inspection and quarantine of stock before removal as has been practised with such success in the Victoria area. No alternative appears to be possible until such time as permanent breaks in contact between cattle and game are established or a reliable vaccine is developed. Research work at Pirbright gives promise that such a vaccine may be forthcoming in the foreseeable future.

Both the Union and the Bechuanaland Protectorate outbreaks had their effect on our cattle industry, necessitating the imposition of a complete embargo on imports of susceptible species to start with; later it was possible to allow entry of stock from the clean areas of the Union, but only through Beitbridge, as the infection in Bechuanaland Protectorate straddled a considerable portion of the normal rail route.

It is of particular interest to note that despite the outbreaks of Foot and Mouth disease which involved imposing controls over considerable tracts of most important cattle-raising country, the figures relating to stock slaughtered at the four main abattoirs at which we are responsible for meat inspection show a considerable increase. Twenty-five thousand more cattle and 2,000 more pigs were slaughtered at these abattoirs than during the previous year. Apart from this, however, in terms of the Turner Commission recommendations there were many more slaughterings by butchers at private or municipal abattoirs.

Rabies

A further 50 confirmed cases are recorded, including three in humans. It is now obvious that we will have this dread disease with us for many years to come.

Vaccine, of which 174,325 doses were used during the year, bringing the total up to 702,862 since we started vaccinating, is undoubtedly playing a useful part in keeping infection within reasonable limits. If it were possible to ensure complete compliance with the terms of the rabies regulations, which require that every dog be vaccinated by the age of four months and re-vaccinated at a year, control would be greatly improved and complete elimination again achieved, notwithstanding the wild animal factor. A striking example of the efficacy of vaccine immunity was seen during an outbreak in jackals east of Salisbury. Here the disease was confirmed in seven jackals, many of which had actually been killed by dogs, but the vaccination cover in the dog population in the area was so good that not a single case of dog rabies developed. It has been shown in other fatal diseases, especially rinderpest, that complete control in domestic animals will eventually lead to elimination of the disease; this proved to be the case with rabies in Southern Rhodesia in 1913. The disappointing feature is that even the enlightened, European dog-owner does not co-operate to the full and often evades his obligations not only to himself but to the country as a whole.

Tuberculosis

The voluntary eradication scheme, which provides for payment of compensation in certain circumstances for reactors slaughtered, is gaining support very satisfactorily and 91 herds are now being attested under this scheme. Many owners whose herds were previously under test in accordance with less binding conditions than those imposed by the compensation scheme are reluctant to join the new scheme. By doing so they would have little if anything to gain as their reactors have already been reduced below the level which would entitle them to the benefits

of compensation. Such herds are, however, still maintained under test, as by doing so the objects of testing, viz.: the control and eventual eradication of tuberculosis, are being achieved.

It is pleasing to record that the number of reactors detected in the 28,990 dairy cattle under test represented only 0.6 per cent. infection. Good progress can be reported in the cleaning up of infection in a large ranch herd on which testing commenced on a pilot basis in 1950. The infection has now been reduced from the original 10 per cent. to less than 0.5 per cent.

Trypanosomiasis

The overall position in respect of this disease is not a happy one. As with the tick transmitted diseases control is best achieved by control of the vector, in this case the tsetse fly. Until such control and eventual eradication of the fly is accomplished efforts must be directed at preventing or curing the disease in cattle. This entails regular supervision of all stock in the areas known to be infested with fly and in the contiguous potentially dangerous areas, with a view to detecting cases of the disease and applying chemoprophylactic and chemotherapeutic control. The only reliable method of detecting infection is by means of smear examinations, of which 27,982 were made. Whether to use preventive or curative drug treatment depends largely on the incidence of infection and the proximity and prevalence of "fly". In areas where the above factors are minimal success in control of the disease can be expected, but in others the outlook is far from bright. Although drugs serve a very useful purpose in preventing cattle from becoming infected, or curing those already infected, a peculiarity of the disease is that the causal parasite (trypanosome) has a tendency to develop resistance to drugs. Thus, when animals are continuously exposed to infection, sooner or later the drug being used will not serve to protect or cure them. Fortunately resistance to one drug does not necessarily mean resistance to another, but there is a limit to the weapons in the armoury and the aim in controlling trypanosomiasis must be directed at the vector.

Over 61,000 inoculations were given and mortality has been kept to a minimum, but grave doubt is expressed concerning the possibility of keeping alive those cattle which have been moved from the Zambezi Valley area which will be inundated by the Kariba Dam into fairly heavy "fly" in the Binga Native District.

Breeding Problems

Diseases and other factors leading to infertility and poor calf crops have long been recognized as of the utmost importance to the livestock industry. These problems have never been relegated to the background, but it has not been possible to give them the attention which they merit, owing to staff being limited and constantly engaged in the prevention and control of diseases which could so easily assume epizootic proportions.

In an attempt to obtain an authoritative overall picture of the problem the assistance of the Food and Agricultural Organization was enlisted and the services of Professor Rasbech, a recognized expert on the subject, were made available to us for three months. An officer experienced in infertility work was also appointed to the Research branch of the Department and assumed duty in January.

The problem as a whole must be regarded as a complex one falling into two main categories, viz.: disease and nutrition (in its widest sense and embracing management).

The disease factor cannot be minimised—we know that Contagious Abortion has accounted for very serious outbreaks of abortion year after year with a variable amount of consequent sterility. But this is a disease which can now be readily and economically controlled with modern vaccines. It should no longer be a cause of trouble if only stockowners would act on the advice constantly given, viz.: to make a routine practice of vaccinating their heifer calves when these are between four and ten (preferably six and eight) months of age. Other diseases, however, still constitute a problem, e.g., epi-vag, vibriosis, trichomoniasis, Rift Valley fever and Wesselsbron virus, and efficient practicable and economic methods of control of these are still to a large extent wanting.

But it would appear, both from our own observations and research as well as from the opinion expressed by Professor Rasbech that of even greater importance than disease is the question of nutrition and management. Details of investigations into this broad aspect are fully recorded in the report of the Assistant Director of Veterinary Services (Research) and the necessity for intensifying this work is all too obvious.

Agalactia in Sows

This condition did not assume such serious proportions but nevertheless in individual herds it was responsible for fairly heavy losses of piglets. Research and field observations in an attempt to determine the cause continued and very promising progress can be recorded.

Almost from the start of the trouble in 1953 we were satisfied that the condition was not in the nature of an infectious disease but was in some way associated with what the sows were fed on. Suspicion attached to various food components, notably carcase meal, fish meal and munga, and to food contamination with D.D.T., but not until the last series of feeding trials was any success in determining the responsible factor obtained.

The evidence now is that ergot infection of munga is primarily, if not entirely, responsible for the type of agalactia which caused so much trouble in the Fort Victoria and Umtali Veterinary districts. Work in America with ergotised barley has clearly proved that the ergot in food there produced agalactia in exactly the same variable degree as we have recorded here.

Further feeding trials to determine the percentage of ergot in munga which constitutes a danger to breeding sows will be undertaken as soon as a method of selecting or concentrating ergotised grains is available.

Conferences

The Director of Veterinary Services represented the Federation at the Annual meetings of I.B.E.D. and I.A.C.E.D. in Dakar in May.

Acknowledgement

The efficiency with which my staff performed their duties, often under extremely difficult conditions, is acknowledged with appreciation as is also the co-operation and assistance of the many other Government Departments with which we had to deal during the year.

Full reports of the Field and Research branches are appended.

D. A. LAWRENCE,
Director of Veterinary Services.

REPORT OF THE ASSISTANT DIRECTOR OF VETERINARY SERVICES (FIELD) FOR THE YEAR ENDING 30th SEPTEMBER, 1957

Staff

Assistant Director of Veterinary Services (Field): Mr. J. MacKinnon.

Senior District Veterinary Officers: Messrs. T. Lees May and J. M. Williamson.

District Veterinary Officers: Messrs. H. M. Hodkin, J. Ross, A. E. Gillespie, A. D. Hurrell, J. E. Robinson and W. P. Boyt.

Senior Veterinary Trypanosomiasis Officer: Mr. R. W. Bryson.

Senior Veterinary Officers: Messrs. A. Wilson, J. L. M. McCulloch, W. A. Mundy, P. Hannan, J. D. Adamson, V. A. D. Browne.

Government Veterinary Officers: Messrs. E. V. Cock, H. R. Thorogood, J. A. Lawrence, R. S. Dugdale, T. T. McNaught, A. J. E. Needham, I. A. Walker, J. J. Jackson, J. R. Philip (seconded to Laboratory).

The Field Establishment of 29 professional officers had four vacancies at the end of the year. As there have been several inquiries from veterinarians overseas it is anticipated that they will be filled within a few months. A factor that militates against overseas recruitment is the absence of paid leave passages to the United Kingdom.

The two sub-stations, Gwanda and Sinoia, were raised to District rank. A further post was created, being that of Senior Veterinary Trypanosomiasis Officer. This officer's main duties are the control of animal trypanosomiasis throughout the country and maintaining collaboration with the Tsetse Control Department.

New Appointments: R. S. Dugdale and T. T. McNaught on 17th November, 1956; J. R. Philip on 10th January, 1957; A. J. E. Needham on 1st April, 1957; I. A. Walker on 8th April, 1957; and J. J. Jackson on 6th August, 1957.

Resignation: Mr. W. J. Nixon terminated his secondment to the Federal Service on the 28th February, 1957.

Animal Health Inspectors. The approved establishment is 78 made up of eight supervisory inspectors and 70 Animal Health Inspectors. The year began with a shortfall of seven and ended with only three vacancies.

New appointments: Fourteen.

Superannuation: One.

Resignations: Eight.

Discharges: One.

It is disappointing to record this high wastage of lay staff. It takes a lot of time, effort and patience to train these men, only to find them lured away, mostly to farming where prospects are much better and conditions in general more congenial.

Meat Inspectors. It must be pointed out here that the Department is only responsible for the inspection of meat at the Cold Storage Commission Works at Bulawayo, Salisbury, Fort Victoria and Umtali and also at Liebigs Factory, West Nicholson. Meat Inspection at other centres is the responsibility of the Municipal authorities.

The approved establishment is 15 Inspectors who must hold both the Royal Sanitary Institute Certificate of Sanitary Inspection (or its recognized equivalent) and the Certificate of Inspector of Meat and Other Foods.

The year opened with two vacancies, and although two new appointments were made, one vacancy remained due to the unfortunate death during the year of Mr. E. T. Blaylock. Efforts have been made to fill this vacancy but owing to the increased salaries being offered to Meat Inspectors both in the United Kingdom and the Union of South Africa, little interest was taken in our advertisements.

Clerical Staff. The approved establishment is 15; of these two are established officers, three on probation and the remaining ten are temporary employees.

Accommodation. It is pleasing to record that one house was purchased for the Department at Gwanda and another built at Lupane; this is a step in the right direction.

The Department has in all 31 quarters of which three are for Meat Inspectors at Victoria and West Nicholson, thus leaving 28 for a total field staff of 107. Owing to the shortage of housing in the country it may well be imagined that field officers are very dissatisfied when transferred. It was hoped that the Plumtree Quarantine Station would have been completed during the year but this was not achieved.

Transport. A pronounced improvement is recorded in this respect. All professional officers, with one exception, used their own private transport on official duties and 70 per cent. of the lay

staff are also operating in a similar manner. Only vehicles of 16 h.p. or over or Landrovers are approved and they must be capable of carrying sufficient fuel to undertake an 800 mile patrol.

During the year under review a total of 93 man days was lost through lack of transport as compared with 180 and 333 the previous two years.

General

Rainfall. General rain set in during November having been preceeded by very high temperatures. Rains continued in some districts into May followed by an early Autumn and a very mild Winter. The Bikita, Chipinga and Ndanga Native Districts recorded low falls, resulting in crop failures and near-drought conditions.

In Mashonaland rainfall was above average; indeed ten inches was recorded in one storm in the Mazoe District resulting in extensive damage to crops. In Matabeleland a mid-summer drought caused a loss of crops in some areas. In general it can be stated, with the expections quoted above, that the past agricultural year was very successful.

Grazing. Following upon the early rains, grazing matured sooner than usual and tended to coarseness. On the sandveld water logging also affected the quality of the grazing. Hay making was difficult. Comparatively little use was made of urea and molasses to increase palatability and digestability of this product for stock.

Natural veld grazing is still relied upon to carry stock throughout the year without the addition of supplementary feeding. It is pleasing to record that increasing interest is being shown in improved pastures and in the general control of grazing as a whole. With few exceptions grazing was adequate except where veld fires did extensive damage and very large tracts of country were denuded.

Condition of Cattle. Cattle maintained condition well, although the general standard was considered to be lower than in the previous year; in spite of this, however, the general standard throughout the country was considered to be fair for the month of September. The mild winter recorded certainly had a beneficial effect on stock. Reports of mortality from poverty have been few and these reports, with few exceptions, refer to overstocked native reserves and neglected European-owned cattle.

Verminosis is marked in both European and Native areas and little is done by the European to his herd unless mortality occurs. Departmental propaganda is aimed at the regular treatment of all stock for verminosis and where regular treatments are undertaken stock has wintered well.

Weaners were, on the whole, poor and it was obvious that a heavy parasitic burden was carried.

Tick Life. Tick life was very active throughout the year. The season opened with a marked winter survival of all types of ticks, particularly the Boophilus. The seasonal upsurge of Rhipicephalus appendiculatus appeared to be greater than ever before; this was brought under control in March but was followed, during May, by a Boophilus flush.

Fewer outbreaks of major diseases in the country enabled inspections under the Cattle Cleansing Act to be carried out with more regularity than was the case in previous years. It can be argued that tick control was more satisfactory in that tick-borne diseases have been fewer than in previous years but regular inspections revealed a marked weakness in tick control as practised by the stockowners during the year.

Professional staff attended as many farmers' meetings as possible stressing the necessity for rigid tick control, explaining the life history of ticks predominant in their areas and explaining how the organic and inorganic acaricides funtioned. At all meetings there has been a lot of comment on alleged resistance of ticks to the various types of dipping preparations. Most of this comment was made without proof and when complaints were investigated by the Department it was found that inefficient dipping was generally the cause of the trouble. Nowadays there are many types of tick destroying agents on the market, especially the organic products which are intended and prescribed for specific types of ticks. However, whether as a direct result of high pressure salesmanship or not, the misuse of these organic preparations continued to the detriment of the stockowners.

The Department has endeavoured to keep the staff up to date regarding the efficacy of dipping preparations with the result that correct recommendations can be made when the opportunity presents itself. It is unfortunate that advice is not sufficiently sought by the stockowners who most need it; indeed, a certain section of these, in the absence of an actively destructive disease, resent helpful advice or constructive criticism. During the year under review the swing back to arsenical preparations continued even although at times difficulty was experienced in bringing flushes of ticks under control solely with the use of arsenic. It is admitted that from time to time difficulty has been experienced in controlling ticks with arsenic alone and the addition of preparations such as D.D.T., B.H.C. and Toxaphene (depending on local circumstances) to full strength washes has been necessary effectively to cleanse stock from ticks. Spray races gained popularity during the year especially where dairying is practised. When they are efficiently used and the organic acaricides regularly changed cattle can be kept tick free at a low cost.

Quarantine Notices. Bulawayo 292, Salisbury 262, Fort Victoria 65, Gwelo 443, Umtali 71, Chipinga 104, Sinoia 92. Total 1,329 which is 242 more than the previous year.

Contraventions. Cattle Cleansing Act: Bulawayo 314, Salisbury 59, Fort Victoria 82, Gwelo 75, Umtali 62, Chipinga 62, Sinoia 7. Total 661.

Animals Diseases Act: Bulawayo 219, Salisbury 88, Fort Victoria 80, Gwelo 43, Umtali 12, Chipinga 3, Sinoia 4. Total 449.

SCHEDULED DISEASES

Viral and Rickettsial Diseases

Foot and Mouth Disease. The disease was confirmed at the Malapati dip tank in the Nuanetsi Native District on the 4th July, 1957. The last recorded outbreak in the country was in the Gutu Native District on the 1st November, 1955.

The comparative freedom from this disease during 1956 and the first half of the present year was a welcome relief to all as staff were able to give more attention to other pressing problems.

The Malapati outbreak was fairly easy to deal with in that it was possible to make extensive cattle-free breaks. In all 9,172 head of cattle were concentrated and cordoned by the 10th July. Inoculation with field virus was completed by the 17th July. On the 30th September, 1957, the cordon was disbanded and the cattle concentration broken up.

The virus was typed as S.A.T.2. Lesions were very severe and reactions to inoculation excellent. Within the infected area two duiker and one kudu were shot showing lesions of the disease.

In the Wankie Native District the year began with weekly inspections in the north-western corner of the country on account of the disease position in the Kazangula area, following a recrudescence of infection in the Caprivi Strip.

On the 12th July, 1957, the disease was confirmed in cattle in the Gwaai Native reserve in the Nyamandhlovu Native District. The first round of inspection revealed that seven dipping areas were infected within the reserve as well as cattle in the Ngamo Forest Area, Nduna dip tank, Gwaai Native Purchase Area, the Gwaai Forest Area, Regina Mundy Mission and the Gwaai Siding, these being part of the Lupane Native District.

From this it will be realized that the disease was spread over a vast tract of difficult country before it was detected. As it was known that there had been extensive movements of game from Bechuanaland via the Wankie Game Reserve and the Ngamo pan to the Ngamo Forest Area and even into the Bembesi Forest Area arrangements were made to carry out a check survey of game in the southern end of the Wankie Game Reserve and Ngamo Forest Area. The survey was undertaken by officials of the Game Reserve and this Department and revealed infection to be definitely present in wildebeeste, kudu, sable and eland. Infection was also determined, with less certainty, in several other species in the Wankie Game Reserve. At the same time it was found that a number of game was suffering from foot rot and mud fever, a condition which was present to a considerable extent in cattle in the northern portion of the Gwaai Native Reserve.

In order to control further spread of the disease the following measures were adopted. In the north the Nanda cattle were withdrawn south-west of the Victoria Falls road and the Gwaai River and concentrated on Crown land under Special Native Constables and Cattle Guards. Similarly, the Ngamo Forest Area cattle were concentrated at Kalogo, the Gwaai Native Purchase Area cattle north of the Gwaai Siding, the store cattle and Regina Mundy Mission cattle on their own ground, the Gwaai Forest Area cattle, normally west of the rail line, were pinpointed to the Gwaai River and the Insezi Forest Area cattle on to the farms Goshen Flats and Uhlanula, thus creating good cattle-free belts to the north and east. In the Gwaai Reserve itself an inner cordon ran from the Tjolotjo weir via Tjolotjo to Siwawa's Kraal on the Nata River close to the Bechuanaland border. To consolidate the position to the east and south an outer cordon ran from the Tjolotjo/Nyamandhlovu road along the fence which divides the reserve from the European area down to the Sameneni Division on to the Bulawayo road thence to the old Ntufu crossing on the Nata River along the Gambo watershed road south of the Nata to join the internal cordon at Siwawa's Kraal.

All cattle were withdrawn as far as possible from the cordon lines with strict instructions for herding and night kraaling. Aphthisation of the cattle commenced on the 27th July and was completed on the 5th August; in all 44,194 were inoculated.

As well as the Police cordon posted on the line, two Animal Health Inspectors with Departmental Cattle Guards reinforced the cordon. It was very soon realized that little herding was done and less night kraaling, in fact native cattle owners gave no co-operation whatsoever. On the 15th and 16th August two minor extensions occurred south of the internal cordon. The cattle were moved north of the cordon and inoculated.

Later the Tjolotjo cattle became infected but the inhabitants refused to move their cattle north of the central cordon line. The refusal of the Tjolotjo natives to move their cattle north of the centre cordon line was a crucial point in the whole campaign because it meant that a satisfactory cattle-free belt could not be established between these cattle and those in the North Nata

Reserve. There was nothing for it but to withdraw the centre cordon and re-orientate the eastern and southern cordons. A double cordon was then placed between the reserve and the European area on the east and the southern cordon strengthened. Inoculation of the 25,931 head involved was completed on the 17th September.

At this stage the efficiency of the cordons left much to be desired. It must be realized that within the Gwaai and Nata reserves the brewing of Kaffir beer went on at a great pace, indeed the Native Commissioners of Tjolotjo and Plumtree stated that both reserves were "nothing but one glorious beer drink". In view of the constant alcoholic abandonment of cattle and the deterioration of cordon units, also liberally supplied with alcohol, together with intimidation of the units by natives who had cattle destroyed, the two Animal Health Inspectors and Cattle Guards reinforcing the cordon put in sterling work in maintaining the position as well as they did.

On the 15th September infection broke through the southern cordon in the South Nata Reserve. The cordon line was re-adjusted to include the six northern dip tanks in the South Nata Reserve and the cattle at these tanks were inoculated with field virus. Inoculation of the 12,540 head commenced on the 25th and was completed on the 27th September. It was realized then that if any further break through occurred a stand could not be made except on the Bulawayo/Plumtree railway line. In view of the gravity of the position Government decided to use regular troops as a cordon and to effect this the Second Battalion K.A.R. took over the Gwaai and Nata cordon line early in October.

On the 19th September the disease was confirmed on Woodlands, a farm adjoining the Gwaai Reserve due east of Tjolotjo. The farm was quickly cordoned and the cattle promptly inoculated. This extension was not of a serious nature as a cattle-free belt had been previously established to the east of it.

On the 26th September a serious position arose in that infection was confirmed in the Umgusa Forest Area. Tracing of the outbreak revealed that infection had started in cattle in the Bembesi Forest Area and cattle from this area transmitted infection elsewhere through dipping contacts. The first affected kraal is situated in a vlei adjoining a private game sanctuary maintained by the Forestry Commission in the Bembesi Forest Area. It has been computed that some 600-800 sable and 2,000-3,000 eland calve down annually in this area. This is the end point of the mid-winter trek of large game previously mentioned and in which evidence of infection had been confirmed during July. As a result of this encircling movement it was decided to inoculate all infected cattle together with other cattle lying between the Gwaai reserve and the Bembesi Forest reserve, thus consolidating the position. A total of 5,826 head of cattle were inoculated.

The virus responsible for this outbreak has been twice typed as S.A.T.1. Throughout, the disease has had highly invasive qualities, reactions to inoculation have been very high and lesions severe. In all cases the lesions were dry by the twenty-first day following inoculation.

The only other outbreak recorded in this area was during 1940 and then only in an isolated heard of cattle in the Wankie Native District.

The Department has now gone forward into the Agricultural New Year with a new problem in that right up against three of the major cattle producing native reserves we can expect game-cattle contact on as large, if not larger, scale as experienced in the Victoria District and on top of that we have to deal with a belligerent type of African who has become accustomed to getting his own way.

Altogether a total of 88,491 head of cattle were inoculated with S.A.T. I type virus and 9,172 with S.A.T. II type.

Rabies. The following cases were confirmed during the year:—

Native District	*No. of Cases*	*Date of Last case*	*Species*	
Beitbridge	—	—	—	
Belingwe	2	17· 4·57	2 dogs	N.V.
Bikita	2	15· 3·57	2 dogs	N.V.
Bindura	2	31· 7·57	2 dogs	N.V.
Binga	—	—	—	
Bubi	—	—	—	
Buhera	—	—	—	
Bulalimamangwe	3	28·5·57	2 dogs 1 honey ratel	N.V.
Bulawayo	—	—	—	
Charter	—	—	—	
Chibi	—	—	—	
Chilimanzi	1	12·2·57	1 kitten	
Chipinga	2	27·9·57	1 dog 1 cat	Vac.
Darwin	4	11·4·57	1 dog 3 dogs	Vac. N.V.
Gatooma	—	—	—	
Gokwe	—	—	—	
Goromonzi	1	12·11·56	Human	
Gutu	—	—	—	
Gwanda	—	—	—	
Gwelo	2	28·2·57	2 dogs	N.V.

Native District	No. of Cases	Date of Last Case	Species
Hartley	—	—	—
Insiza	—	—	—
Inyanga	—	—	—
Kariba	—	—	—
Lomagundi	—	—	—
Lupane	—	—	—
Makoni	—	—	—
Marandellas	7	26·8·57	6 jackals 1 dog N.V.
Matobo	—	—	—
Mazoe	7	11·4·57	2 jackals 1 honey ratel 1 dog N.V. 2 cows. 1 horse
Melsetter	—	—	—
Mrewa	—	—	—
Mtoko	3	1·7·57	2 dogs N.V. 1 Human
Ndanga	—	—	—
Nkai	—	—	—
Nuanetsi	1	12·2·57	1 dog N.V.
Nyamandhlovu	—	—	—
Que Que	—	—	—
Salisbury	2	23·9·57	1 dog N.V. 1 jackal
Selukwe	1	2·11·56	1 dog N.V.
Shabani	1	15·12·56	1 dog Vac.
Shamva	—	—	—
Sipolilo	—	—	—
Umtali	—	—	—
Umzingwane	—	—	—
Urungwe	—	—	—
Victoria	3	23·11·56	1 Human 1 dog Vac. 1 dog N.V.
Wankie	5	19·8·57	5 dogs N.V.
Wedza	1	18·10·56	1 dog N.V.

Results according to species:—

Dogs	31
Jackals	9
Cats	2
Honey Ratels	2
Cows	2
Horses	1
Humans	3
TOTAL	50

Over the last three years the number of positive cases of rabies diagnosed has decreased from 100 in 1955 to 50 in 1957. The total number of cases confirmed since the outbreak started in 1950 is 824.

During the year under review 174,325 dogs were inoculated with Lederle's Flury strain of egg-adapted rabies vaccine thus raising the total number of inoculations performed since July, 1951 to 702,862.

Four vaccinated dogs developed rabies during the year. In one case it appears that the dog had been vaccinated as a pup but had not been re-vaccinated as an adult. That is to say, the immunity would have had every opportunity to wane. In another case it is most probable that the animal was incubating the disease when vaccinated. Insufficient information is available on the history of the remaining two cases.

Since vaccination was initiated rabies has been confirmed in 116 vaccinated dogs. The breakdown analysis of this figure is:—

Rabies confirmed in dogs less than 1 month after vaccination	18
Rabies confirmed in dogs less than 6 months after vaccination	23
Rabies confirmed in dogs more than 6 months after vaccination	53
Rabies confirmed but vaccination date not known	22
	116

When we take into consideration the fact that the incubation period of rabies may extend to six months and therefore the possibility of some dogs having been infected prior to vaccination, it is probably fair to disregard the majority of breakdowns which occurred within six months of vaccination. Even so there remain 53 cases of rabies in dogs which were vaccinated over six

months previously, and 22 cases about which insufficient evidence is available. Several factors probably account for these failures:—

(i) It is recognized that no vaccine of this description will give 100 per cent. immunity.

(ii) Individual idiosyncrasy, some animals remaining refractory to all efforts to establish immunity. Six of these 53 cases had been vaccinated twice and one thrice.

(iii) The waning protection supplied by puppyhood vaccination if not reinforced by inoculation when adult.

(iv) The accidental deposition of the vaccine in a subcutaneous site during intensive mass inoculation campaigns, or the deterioration of the vaccine under tropical field conditions.

It is interesting to note that most of these breakdowns occurred in the early days of the outbreak, when the use of the vaccine was not so well understood by all members of the field staff. Only 15 breakdowns in all categories, have occurred during the last three years.

The rapid turn-over of dogs in the native areas, with an almost completely new dog population every 18 months, continues to hamper efforts to achieve an overall effective level of vaccination coverage. Another complication is the unofficial migration into Southern Rhodesia of African owned dogs from neighbouring territories. European dog owners need to be frequently reminded of the need for vaccination and re-vaccination.

In the districts to the east of Salisbury, seven cases of rabies were confirmed in jackals during the second half of the year. Fortunately the disease did not break through into the domestic dog population indicating that a satisfactory level of vaccination coverage had been achieved in those areas. The same cannot be said of the Wankie District which suffered five proven cases of rabies in unvaccinated dogs during the year.

Local tie-up orders were imposed for periods of 90 days at a time in the outbreak areas of Southern Rhodesia as an adjunct to the control of rabies by vaccination.

Two cases were confirmed in Honey Ratels (Mellivora capensis). These badger-like creatures are noted for their ferocity at any time and are particularly aggresive when infected with rabies. In the Mazoe District one of these animals attacked four cows and a horse, all of which subsequently died. The brains of the horse and two of the cows were submitted for laboratory examination and were confirmed as rabid. The cows developed furious symptoms after an incubation period of between 45 and 92 days. The horse developed paralytic symptoms after 142 days. In the Bulalima-Mangwe District humans were savagely attacked by a Honey Ratal which was eventually killed and submitted for laboratory diagnosis.

The occurrence of rabies in Bulalima-Mangwe is a source of disappointment in that no cases had been confirmed in this border district for 18 months. It is suspected that the disease was introduced from a neighbouring territory.

Three humans died of rabies during the year. In two of these cases no medical attention was sought. However, the third case was inoculated within half an hour of being bitten and received the full course of 14 injections.

Lumpy Skin Disease. In comparison with the previous year the disease was widespread. In some areas a particularly virulent visceral type was recorded with a high mortality. Other areas reported extensive sloughing of the skin and again reports were received of such mild infection that detection was difficult.

Contagious Epididymitis and Vaginitis. During the year new centres of infection were confirmed as follows:—

Salisbury 5, Fort Victoria 1. Total 6.

Releases from quarantine were:—

Bulawayo 19, Salisbury 34, Gwelo 2, Sinoia 4. Total 59.

In quarantine at the end of the year:—

Bulawayo 13, Salisbury 47, Fort Victoria 16, Gwelo 5, Sinoia 11. Total 92.

This latter figure shows a decrease of 58 properties in quarantine. Over the last two years a gradual unspectacular improvement has been recorded in regard to the fertility on infected properties. The research investigation into the disease in this and neighbouring countries has brought nothing new to light. Professor Rasbech, an international authority on infertility problems in stock, spent three months in the country at the beginning of the last Agricultural year investigating the disease. As a result of his visit a certain line of research was followed but little advance was made. The steady headway made in cleaning up infected premises has given cause for sober satisfaction.

Rift Valley Fever and Wesselsbron Virus. During the year further evidence of infection was detected in both cattle and sheep. No major outbreaks of abortion in cattle were associated with either of these conditions.

Heartwater. Mortality has been reported from 57 properties but it has been found impossible to assess an approximation of the actual deaths attributable to this condition.

It is reported also that the use of Toxaphene in dip washes has materially reduced mortality through the control of the vector.

The immunisation of calves on a ranch in the Gwanda Native District was discontinued during the year.

An attempt was made to ascertain if sufficient losses occurred on European farms to justify the creation of a vaccine centre but replies to the questionnaire were both tardy and disinterested.

Bacterial Diseases

Anthrax. No outbreaks were recorded during the year, however, suspicious mortality occurred in the Belingwe reserve and the decision was taken to re-inoculate all stock as outbreaks had occurred in this reserve from time to time.

Annual inoculations at previously infected foci were carried out as follows:—

Bulawayo 104,781, Salisbury 29,475, Fort Victoria 2,170, Gwelo 251, Chipinga 194, Sinoia 3,600. Grand total = 140,471.

Quarter Evil. Outbreaks were confirmed as follows:—

Bulawayo	80 outbreaks	300 deaths
Salisbury	45 outbreaks	144 deaths
Fort Victoria	21 outbreaks	154 deaths
Gwelo	19 outbreaks	46 deaths
Umtali	22 outbreaks	66 deaths
Chipinga	23 outbreaks	45 deaths
Sinoia	10 outbreaks	47 deaths

It is very disheartening once more to record that many deaths occur from this disease through the failure of the stockowner to vaccinate. Two years ago the farming community stressed at great length the necessity for a combined Quarter Evil and Malignant Oedema vaccine; this want has been supplied but has not been used to any extent.

The farming community constantly stress the need to increase fertility in their herds yet thousands of young stock are lost annually through their neglecting to vaccinate calves with the cheapest form of vaccination on the market. There is no excuse for this annual loss.

Bovine Brucellosis (Contagious Abortion). Infection was confirmed on premises as under:—

Bulawayo 22, Salisbury 17, Fort Victoria 2, Gwelo 3, Umtali 6, Chipinga 3, Sinoia 3. Total 56.

Three thousand four hundred and eighty-seven blood samples were tested showing 230 reactors.

The advisability of making full use of S.19 vaccine to prevent Contagious Abortion has been regularly stressed. The demand for the vaccine has shown a steady increase but not nearly sufficient use is yet being made of it. The recommended system is to vaccinate all heifer calves between the age of four and ten months (preferably six-eight months). The vaccine may also be used on adult cattle, if calfhood vaccination has not been practised, but some untoward results have been recorded in adults, milk yields dropping seriously and sloughs resulting at the the site of inoculation.

Tuberculosis.

A. Importations — Total tested 1,080, Reactors 4.

B. Exportations — Total tested 3,526, Reactors Nil.

C. Umtali Eradication Scheme —

	Number of herds	*Number of cattle*	*Number of Reactors*
Scheme A.	6	652	1
Scheme B.	2	403	10
D. Voluntary Scheme —			
Umtali	26	1,379	1
Bulawayo	67	5,018	10
Salisbury	127	10,348	5
Gwelo	21	1,394	2
Melsetter	22	1,219	nil
Sinoia	7	984	1
E. Compensation Scheme —			
Umtali	20	1,604	8
Bulawayo	19	1,108	99
Salisbury	40	3,784	35
Gwelo	7	305	4
Melsetter	5	792	1
TOTAL	369	28,990	177

It will be noted that the number of herds under test has increased by 61 and the number of cattle under test by 5,247 head.

The Compensation Scheme is proceeding satisfactorily and new applications are being received at a steady rate. Ninety-one herds are now being dealt with under the Scheme as opposed to seven at the end of last year. The amount of compensation paid out has so far proved much less than was anticipated.

In view of the satisfactory progress made in the eradication of the disease it has been found possible to test approved clean herds biennially instead of annually. This has been a considerable relief for the professional officers of the Department and has meant that new applications can be dealt with expeditiously.

The number of reactors will be seen to have increased from 58 to 176 but it must be pointed out that 86 were in two herds. In actual fact the vast majority of herds which are tested are found to be free from infection.

Further progress has been made in eradicating tuberculosis from a large ranch in Matabeleland. The annual test revealed 83 reactors (0.41 per cent.) out of a total of 20,120 head of European stock and ten reactors (0.57 per cent.) amongst the 1,745 head of native owned stock. This is a marked improvement on last year when the percentages for European and Native stock were 8.82 per cent. and 0.90 per cent. respectively.

Complete eradication of the disease from this ranch will not take place until it becomes possible to slaughter all reactors immediately after testing. The number of reactors in isolation is being reduced but while any exist the problem of straying back to the clean herds remains.

Meat inspection revealed infection in a ranch in the Eastern Districts. The whole herd of 571 head was tested twice revealing five reactors.

Meat Inspection Incidence:—

	Bovine	*Porcine*
Cold Storage Commission, Bulawayo	97	124
Cold Storage Commission, Salisbury	17	24
Cold Storage Commission, Umtali	4	4
Cold Storage Commission, Ft. Victoria	3	1
Canning Factory, West Nicholson	133	5
TOTALS	254	158

Protozoal Diseases

Piroplasmosis. Confirmed cases were as follows:—

Bulawayo 44, Salisbury 38, Fort Victoria 3, Gwelo 31, Umtali 20, Chipinga 45, Sinoia 6. Total 187.

It is considered that these figures are out of proportion to the actual incidence of the disease. As the disease is well known to the stockowner and the fact that very reliable remedies are easily available, treatment is given and no reports made.

African Coast Fever. The last recorded outbreak of this disease occurred on the 10th March, 1954, on Reitvlei Farm in the Chipinga Native District. The cattle were all slaughtered and the farm kept cattle-free until May, 1956, i.e. a full two years after slaughter.

Intensive supervision of cattle and dipping has been maintained in both the Chipinga and Melsetter Native Districts with negative results.

Theileriosis. Outbreaks were confirmed as follows:—

	Outbreaks	*Deaths*
Bulawayo	2	2
Salisbury	14	57
Fort Victoria	4	370
Umtali	10	19
Sinoia	4	153
TOTAL	34	601

The incidence of the disease was less than in the previous year when 46 outbreaks were recorded. The mortality, however, was higher in that two outbreaks had a death rate of 293 and 140 each. So far no drug has been found to have any effect on the course of the disease, nor has any information come to light which refutes the opinion that after an attack of the disease the recovered animal acts as a carrier.

Quarantining, short interval dipping and hand-dressing continue to be the control measures adopted.

At this stage, for record purposes, a brief description of the origin and spread of this tick-borne disease may serve a useful purpose particularly when it is realized that there are only two officials serving in the Department who were involved in the original outbreak.

In January, 1934, a heavy mortality from an unknown condition was reported from Chisi Section of Nuanetsi Ranch. Investigations proved the condition to be tick borne and the names Buffalo or Chisi disease were given to it, the former name on account of the association of the

cattle with large herds of buffalo, the latter the name of the ranch section. All cattle on the Nuanetsi Ranch were disposed of during 1935 and the disease next made its appearance on Fortuna, a farm in the Chipinga Native District. It appears that the owner of Fortuna had purchased cattle at the Nuanetsi dispersal sale. On Fortuna the disease was renamed Specific or Fortuna disease.

The disease next made its appearance on two farms in the Lomagundi Native District following upon movements of store cattle from Fortuna to the Umboe Valley. The two farms in question carried pedigree and high-grade Friesland cattle and suffered a high mortality with micro- and macro-scopic lesions indistinguishable from African Coast Fever and the herds were treated as if suffering from African Coast Fever. On release from quarantine restrictions the one property was disposed of in 1939 and the cattle were sold to buyers from all over the territory.

During December, 1939, the disease appeared in another milk herd, this time in the Salisbury Native District. Cows had been acquired at the dispersal sale early in the year from the previously infected centre in the Umboe Valley. Once again mortality was extremely heavy until tick life was brought completely under control. The cattle on this infected property were dispersed during the year 1941.

Following upon this last dispersal the disease has been detected on a considerable number of farms and continues to invade new farms.

Fortunately stock owners are becoming more aware of the importance of the disease and in a number of cases have disposed of their herds for slaughter where this was feasible on economic grounds.

The disease was given the general name Theileriosis and the piroplasm involved has been named Gonderia lawrencei.

Trypanosomiasis. This disease continued to be one of considerable economic importance. In order to facilitate control a recommendation of the Commission of Enquiry into Human and Animal Trypanosomiasis in Southern Rhodesia was adopted in that a special Trypanosomiasis Unit was created operating within the framework of the Department of Veterinary Services. It had been recommended that the Unit should be composed of three Veterinary Surgeons and 12 Animal Health Inspectors. An embryo unit was set up during November, 1956, consisting of the Senior Veterinary Trypanosomiasis Officer and six Animal Health Inspectors. This unit operated in the Native districts of Binga, Gokwe, Lupane and Nkai. These areas had less veterinary cover than other districts and appeared vulnerable on account of increased human activity.

The following table shows the number of smears taken, confirmed cases and treatments undertaken in all areas:—

District	*Smears*	*Positives*	*Inoculations*
Binga	1,828	116	8,089
Chipinga (European)	3,301	95	25,328
Chipinga (African)	—	10	—
Gokwe	5,186	42	5,037
Inyanga	228	15	3,452
Lupane	3,393	35	11,564
Lomagundi	—	1	1
Mtoko	1,218	44	860
Mrewa		Nil	Nil
Ndanga	196	42	6,577
Umtali	76	1	1
Urungwe	10,278	20	602
Nkai	2,278	1	50
	27,982	422	61,561

These figures show an increase of 4,954 blood smears, 224 positives and 14,435 inoculations over the previous year.

The disease position in the various districts is given hereunder:—

Binga and Gokwe Native Districts. These two contiguous districts can be taken together since for the first portion of the year they were as one being known as the Sebungwe district. In all eight new foci of infection were confirmed and practically all the old centres became reinfected. Infection was controlled successfully by inoculations with Antrycide D.M.S. every second month.

In the Binga district Africans living in the Lake Kariba basin area were moved from the Zambezi River bank on to high land. The Africans elected to move into an area which is infested with tsetse and, against Departmental advice, took all stock with them.

Within six weeks of the cattle moving on to the plateau 40 per cent. were confirmed as infected. The cattle are being maintained so far successfully by means of bi-monthly inoculation with Antrycide D.M.S. Part of this area was treated during the year by the aerial spraying of insecticide which certainly reduced, but did not eliminate the tsetse fly.

On the Mzola River front the cattle fence was extended eastwards and the game fence to the north was completed. So far neither fence has proved of value as the percentage of infection was greater during the year than previously. It is hoped that by maintaining a cattle and game-free barrier between the fences that the vector will be starved out. A total of 13,126

Antrycide inoculations was given and therefore the protective cover afforded somewhat masks the true disease incidence.

Chipinga Native District. In the African areas there was a sharp drop in the number of confirmed cases. Those centres which had previously returned up to 70 cases per annum and suffered a high death rate, have not, since the use of Antrycide was initiated in November, 1955, registered a single positive case. Originally Antrycide Pro-salt was used at three monthly intervals on cattle at these centres but owing to buyer resistance at cattle sales on account of unsightly lumps on the rumps of cattle a change was made to the Dimethyl Sulphate.

In the Chisumbanje area on the east bank of the Sabi cases were confirmed in cattle. During June, 1956, the use of Antrycide was discontinued in these cattle in order that the position could be assessed in regard to incidence of the disease. It is evident that there is little change in the disease incidence and to control the disease the cattle were again subjected to Antrycide inoculations.

In the European area there is recorded a definite deterioration. Positive cases in 1955 were 67 on 16 premises, 1956 were 22 cases on 11 premises and in 1957 were 95 cases on 17 premises. Block inoculation of cattle is not undertaken; only individual cases are treated.

Inyanga Native District. A total of 15 cases was confirmed from three centres. Cattle at the two eastern centres of infection have been placed under regular Antrycide D.M.S. treatment.

Umtali Native District. One case of T. vivax infection was detected in a bovine on a border farm. All cattle on the property and on adjacent properties were smeared with negative results.

Lupane Native District. Only one new centre of infection was detected. Infection reappeared at a previously infected focus. Only 35 cases were confirmed. Here as elsewhere the regular use of Antrycide has controlled the disease.

Mrewa Native District. Not one case was confirmed during the year, due entirely to the withdrawal of Fungwe Reserve cattle south of the cattle fence. Regular monthly inspection was maintained throughout the year.

Mtoko Native District. Not one case of the disease was confirmed in the Mtoko Reserve cattle. Again it is considered that the cattle fence on the northern boundary of the reserve played a very important part in that the cattle were confined to the reserve.

In the Chikwizo Native Reserve a marked deterioration occurred. In all 22 head of cattle and 22 donkeys were infected by April and Antrycide D.M.S. was used as a block treatment in both cattle and donkeys. Since then regular bi-monthly block inoculation has been undertaken without further cases occurring.

Nkai Native District. During the year infection was detected for the first time following the movement of elephant into the vicinity of the Nyage dip area. Infection (T. vivax) was confirmed in only one bovine.

Ndanga Native District. A very serious deterioration has been recorded in the Ndanga East Native Reserve in as much that G. morsitans has become established in the southern portion. Throughout the year cattle adjacent to the fly pocket in the reserve were protected by the regular use of Antrycide Pro-salt. During the year a further dipping centre was found infected and regular Antrycide treatment was adopted.

To the west and north of the reserve a game fence was in the process of erection to create a game and cattle-free belt on these sides.

It will be appreciated that the regular use of Antrycide compounds on cattle whilst controlling the disease itself, masks the incidence of infection. During the coming year the regular use of Antrycide in some areas will be discontinued in order to assess the disease incidence.

Fungal Diseases

Streptothricosis (Senkobo Skin Disease). This condition was reported from the Lupane, Wankie and Gokwe Native Districts and was generally mild in character.

On one property, however, infection was severe and caused a number of deaths. On this property there was no dip tank and the owner depended on hand spraying of the cattle with organic acaricides for tick control.

Experimental treatment was undertaken with various preparations but none proved either specific or economic to apply.

Diseases due to Mites

Sheep Scab. Two outbreaks were recorded, one from Chipinga and the other from Salisbury. Regular immersion of the affected flocks in B.H.C. eliminated the condition.

SCHEDULED POULTRY DISEASES

Viral Diseases

Newcastle Disease. There were no outbreaks of this disease during the year.

Chicken Pox and Roup. Numerous outbreaks were recorded but no serious mortality was reported.

Bacterial and Spirochaetal Diseases

Fowl Cholera. A total of 11 outbreaks was confirmed resulting in the destruction of 1,384 fowls and 24 ducks.

Fowl Typhoid. Confirmed outbreaks as follows:—Bulawayo 2, Salisbury 2, Fort Victoria 1, Umtali 3, Sinoia 1. Total 9 outbreaks.

Only in two outbreaks was there appreciable mortality. The disease was eliminated on all the infected properties by testing and slaughter of all reactors and strict disinfection of premises.

Bacillary White Diarrhoea. A total of 231 B.W.D.-Free Certificates was issued, an increase of 29 over the previous year. The number of birds covered by the certificates dropped from 130,942 the previous year to 124,018.

No outbreaks of the disease occurred.

Spirochaetosis. This condition was confirmed on nine properties.

Protozoal Diseases

Coccidiosis. Numerous outbreaks were recorded, particularly amongst small plot holder flocks. The condition is easily diagnosable and effective treatments are available.

NON SCHEDULED DISEASES

Ephemeral Fever. There is little to report. The disease was widespread during the rains and a few deaths were reported.

Ophthalmia. A marked drop in the incidence of this condition is recorded. It is considered that the use of organic acaricides has had direct bearing on controlling the condition.

Paratyphoid. A total of 18 centres of infection was confirmed. Calfhood vaccination, with its limited cover, is still practised on infected properties. Maternal vaccination has not been adopted to any considerable extent. It is impossible to give an estimate of the mortality.

Coccidiosis in Cattle. A number of outbreaks was confirmed in young cattle. No mortality figures can be given.

Anaplasmosis. Cases have been confirmed as follows:—

Bulawayo 34, Salisbury 95, Fort Victoria 7, Gwelo 25, Umtali 45, Chipinga 60, Sinoia 21. Total 287.

This figure represents the confirmed cases only and is considered to be a small fraction of the actual number of cases which must have occurred. The disease is easily diagnosed and stock owners undertake the treatment of stock themselves.

Myiasis. The incidence of this condition was lower than in previous years probably as a result of the use of the organic acaricides in dip washes.

Horsesickness. The personnel of the Department dealt with only ten cases. It is reported that private practitioners dealt with a number of cases. Accurate figures of mortality cannot be given. The freeze dried vaccine, which is recognized as the best to ensure full potency, is less popular with horse owners than the liquid vaccine, no doubt owing to the slight additional trouble involved in preparing it for injection.

Equine Biliary Fever. A total of five cases was confirmed.

Agalactia in Pigs. This condition gave little trouble during the year, only a few cases being reported from Fort Victoria where most trouble had been experienced in the past. Both the farming and daily press gave prominence to the condition by publishing articles from time to time stressing the need to use preventive vaccines. The result of this misleading press advice has led to considerable misunderstanding.

In order to clarify the position let it be stated that Ross's (Fort Victoria) Agalactia is an afebrile condition, with little or no mammary development, and in which there is more or less complete failure to secrete milk. A decrease in milk yield, even to the extent of complete cessation of production, may follow mastitis, metritis or any other febrile condition, but these are quite distinct conditions.

Feeding experiments have shown conclusively that agalactia, as recorded in Fort Victoria, can be established, probably as a result of parasitised grains, without any bacterial involvement of the udder or uterus or any febrile reaction. In many cases the agalactia troubles were overcome simply by getting owners to change their rations.

Verminosis. It is recorded that much more interest has been shown in this very important problem. An appreciable number of stock owners have attempted to reduce infestations in their

herds by regular treatments. Although not dramatic, good results have followed the correct dosing of stock. On the other hand losses have followed incorrect and faulty treatments.

The Department has successfully continued to stimulate interest in this neglected aspect of the livestock industry.

Other Diseases. Steady progress is recorded in tracing conditions such as Vibriosis and Trichomoniasis of cattle. The extent of these infections has not yet been determined.

During the course of the year the Department has dealt with minor diseases and conditions such as Enterotoxaemia, Strangles, Aphosphorosis, Photosensitisation and Malignant Oedema.

POISONING

	Arsenic	*Mineral Various*	*Vegetable*
Bulawayo	150	7	300
Salisbury	132	30	30
Fort Victoria	26	1	—
Gwelo	135	16	—
Umtali	124	5	38
Sinoia	42	44	—
Chipinga	63	—	—
TOTALS	672	103	368

Geilseikte (Prussic Acid)—Few cases were recorded.

Artificial Insemination. In and around the Salisbury District this service has become very popular. Following upon the stationing of a full time inseminator at Bulawayo much more interest has been taken by local dairymen.

In conclusion I wish to express my thanks to both Federal and Territorial Departments with whom the Department of Veterinary Services has worked during the past year. I wish also to express my appreciation to all members of my staff who have at all times given of their best during this past year.

STOCK SLAUGHTER FIGURES

	Cattle	*Pigs*	*Sheep and Goats*
Bulawayo	56,836	16,634	124
Salisbury	68,627	39,017	6,203
Fort Victoria	18,034	4,749	616
Umtali	9,165	8,107	2,345
Liebigs Factory, West Nicholson	12,084	1,491	—
	164,746	69,998	9,288

The corresponding figures for last year were—Cattle 139,545: Pigs 67,971: Sheep and Goats 12,199.

CARCASE CONDEMNATION

	Cattle	*Pigs*	*Sheep and Goats*
Bulawayo	465¼	319¾	—
Salisbury	558¼	48½	10
Fort Victoria	248	22	—
Umtali	52	27	1
Liebigs Factory, West Nicholson	82	—	—
	1,406¼	417¼	11

MAIN REASONS FOR CONDEMNATION

	Cattle	*Pigs*	*Sheep and Goats*
Emaciation and Oedema	560	22	3
Measles	383	353	—
Pleurisy and Peritonitis	130	1	—
Sarcocysts	82	8	—
Bruising	44¾	1½	½
Pyaemia and Septicaemia	33	20	—
Pyrexia	19	2	1
Tuberculosis	12¾	2	—
Onchocerciasias	13	—	—
Icterus	9	—	2
Caseous Lymphadenitis	—	—	4½

CATTLE CENSUS AND DIPPING TANKS

	European	*Native*	*Total*	*Dip Tanks*	*Spray Races*
Bulawayo	430,816	635,793	1,066,609	967	54
Salisbury	304,490	297,797	602,287	1,150	225
Gwelo	250,671	231,708	482,379	859	8
Fort Victoria	163,721	386,484	550,205	579	32
Umtali	70,695	146,352	217,047	435	45
Chipinga	49,417	46,103	95,520	257	14
Sinoia	94,573	52,890	147,463	328	55
Trypanosomiasis Unit Area	7,252	85,768	93,020	108	1
TOTAL	1,371,635	1,882,895	3,254,530	4,683	434

IMPORTATION OF LIVESTOCK, 1956–57

	South Africa	*United Kingdom*	*United States of America*	*Bechuanaland*	*Total*
Bulls	281	2	6	3	292
Cows	124	—	1	30	155
Heifers	563	17	17	—	597
Calves	55	—	1	3	59
Mares	210	3	—	—	213
Stallions	73	1	—	—	74
Geldings	317	—	—	—	317
Mules	69	—	—	2	71
Pigs: Breeding	17	—	—	—	17
Pigs: Slaughter	—	—	—	1,551	1,551
Sheep: Breeding	828	—	—	—	828
Sheep: Slaughter	—	—	—	2,489	2,489
Goats: Breeding	58	—	—	—	58
Goats: Slaughter	—	—	—	479	479
			TOTAL		7,200

Bovine 1,103: Equine 675: Porcine 1,568: Ovine 3,317: Caprine 537.

EXPORTATION OF LIVESTOCK, 1956–57

	Northern Rhodesia	Nyasaland	South Africa	Portuguese East Africa	Bechuana-land	Belgian Congo	Kenya	Angola	Totals
Bulls	153	9	5	4	—	12	4	12	199
Cows	1,391	—	—	31	—	—	—	—	1,422
Heifers	4,875	2	71	57	10	473	5	16	5,509
Calves	21	4	-	—	—	—	—	—	25
Oxen	4,883	—	-	5	—	—	—	—	4,888
Mares	1	—	10	—	—	—	—	—	11
Stallions	—	—	2	—	—	—	—	—	2
Geldings	51	20	9	1	—	—	—	—	81
Donkeys	55	—	—	-	—	—	—	—	55
Pigs	183	10	—	—	—	—	—	—	193
Sheep	1,241	3	1	-	—	239	—	—	1,484
Goats	442	—	-	13	—	—	—	-	455

SLAUGHTER STOCK TO NORTHERN RHODESIA, MARCH, 1957 — SEPTEMBER, 1957

56 Bulls, 471 Cows, 44 Heifers, 3,419 Oxen } Total head . 3,990

TOTAL 18,314

Bovine 16,033: Equine 149: Porcine 193: Ovine 1,484: Caprine 455.

J. MacKINNON,
Assistant Director of Veterinary Services (Field).

REPORT OF THE ACTING ASSISTANT DIRECTOR OF VETERINARY SERVICES (RESEARCH) FOR THE YEAR ENDING 30th SEPTEMBER, 1957

Staff

The following is a list of staff as at the end of the report year:—

Acting Assistant Director of Veterinary Services (Research), Mr. G. J. Christie.

Senior Veterinary Research Officer (S.P.O. II), Mr. D. K. Shone.

Veterinary Research Officers (P.O.), Messrs. R. M. Roberts and J. R. Philip (on secondment from Field Staff).

Chief Laboratory Assistant (S. & T.O. II), Mr. G. E. Wells.

Laboratory Assistants, Messrs. D. B. Vickers and F. J. Becks.

Lay Inseminators, Messrs. R. A. W. Price and J. S. Ward.

Animal Health Inspector, Mr. J. M. Selby (on secondment from Field Staff).

Station Superintendent, Mr. F. J. A. Waller.

Stockman (Gwebi), Mr. A. Craddock.

Administrative and Clerical Officer, Mr. E. B. Carnduff.

Clerical Officer (Typist), Mrs. E. H. Harrison.

Although our veterinary complement is six professional officers, only two were on the staff until January, 1957. By the end of February, Mr. J. R. Philip and Mr. V. A. D. Browne had been appointed on secondment from the Field Staff and Mr. R. M. Roberts to a permanent appointment. Mr. V. A. D. Browne moved to Head Office at the end of May.

Our technical staff was augmented by the appointment of Mr. D. B. Vickers, in December, 1956.

These welcome additions to the staff have enabled us to cope with our diagnostic services and also investigate a few of our more urgent disease problems. Our most difficult staff problem, however, is still the acquisition of sufficient technical assistance — a considerable build up is required to obviate the necessity of the professional officer having to undertake his own technical work.

In order to cope thoroughly with investigations of the varied problems which periodically confront us it is necessary to build the professional staff up to include a parasitologist, a pathologist and a biochemist. Mr. V. A. D. Browne, during the brief period he was seconded to the Laboratory, coped very efficiently with our parasitological problems.

With the improvement of cattle and the tendency to heavier stocking rates, the considerable increase in temporary pastures and irrigation, and the marked interest shown in sheep at present, the appointment of a parasitologist to the staff is becoming a question of extreme importance. Our histopathology, with the actual exception of Rabies diagnosis, is dealt with through the courtesy of the Director of Veterinary Services, Onderstepoort, but of course the amount of work we can and do send down to Onderstepoort is only a very small proportion of that requiring to be undertaken.

Biochemical analyses are at present forwarded to the Chief Chemist, but again he has his own committed programme, so that we are only able to make a very limited use of that service.

Mrs. E. T. Cole, who had been with us seven years in the professional officer grade, retired from the service during the year and although this post was removed from our establishment, it is being replaced by a technical assistant post.

Buildings

The new vaccine block was occupied in February, 1957, and has proved to be an extremely useful addition to the Laboratory facilities.

In view of Municipal encroachment, no further building development has taken place at the Borrowdale Road premises, but we are engaged in extending the facilities of the Gwebi Epi-Vag Station.

ROUTINE SERVICES

Diagnostic Services

Smear Examination. The major portion of the 3,494 blood smears examined at the Laboratory during the year were in connection with trypanosomiasis surveys being conducted in certain areas. The following are the details of the individual diagnosis:—

Piroplasmosis	2
Anaplasmosis	10
Theileriosis	10
Trypanosomiasis	33
Tuberculosis	1
Fowl Cholera	2

Serological Tests. This year, 4,654 agglutination for Contagious Abortion were undertaken with blood samples, while in addition 138 milk samples were checked by the ring test; 338 posi-

tives were recorded in the blood samples and seven positives in the milk samples. Bulawayo district office now undertake their own agglutination tests.

Other Diagnostic Methods. A total of 5,930 specimens were received during the year for diagnosis and the following conditions and diseases have been diagnosed from these specimens.

Rabies	50 cases

Two hundred and eight specimens were received for diagnosis and biological examinations were undertaken in all the histological negatives; only three histological negative specimens proved positive on biological. The following is the classification of actual positives: 31 dogs, of which three were vaccinated, two cats, nine jackals, two bovines, one horse, two badgers and three human cases. Six of the jackal cases occurred in one area, but only one case was recorded in that area in dogs which suggests that the vaccinal cover achieved was very effective.

On one premises a badger which attacked the farm animals was responsible for the loss of four cows and one horse from rabies although the latter did not show symptoms until 4½ months after the visit of the badger.

The three human cases which occurred were Africans and all had known dog contacts. One case is of especial interest, as the individual was treated within half an hour of contact with carbolic acid, 600,000 units of penicillin and had a 14 day course of vaccine. Unfortunately no hyper-immune serum was available in the area. The incubation period was approximately 58 days.

Tuberculosis	12 cases

Biological tests were undertaken on 37 occasions to obtain these 12 positives. The majority of these were from animals which had reacted to the tuberculin test and from which lymphatic glands were forwarded. It should be realized in such cases that firstly, owing to the difficulty in obtaining all the animals' lymphatic glands and secondly because of the large number of guinea pigs necessary for a complete biological, that only a positive result is of any real value.

Johne's Disease	1 case

This specimen was a portion of bowel submitted from a cow imported from the United Kingdom. Several cases of Johne's Disease have been diagnosed during the last few years, but all were from animals imported from the United Kingdom and in no case has any spread occurred.

Quarter Evil	5 cases
Malignant Oedema	1 case

Thirteen specimens of muscle were submitted for examination with the above results. Outbreaks of Malignant Oedema have occurred in animals vaccinated against Quarter Evil and on such premises the use of the combined vaccine is advocated.

Calf Paratyphoid	2 cases
Mastitis	84 cases
Internal Parasites	41 cases
Poisoning	53 cases

Tuberculin Tests. Fifty-two tests were undertaken in the Laboratory Stables on imported animals; no reactors were found.

Poultry. A total of 1,198 post mortem examinations were undertaken with the following results:—

Fowl Typhoid	31 cases
Fowl Cholera	10 cases
Fowl Pox	8 cases
Coccidiosis	254 cases
Roup	26 cases
Tumours	188 cases
Helminth Infestations	21 cases
Oophoritis, Salpingitis, etc.	76 cases
Histomoniasis	42 cases
Aegyptionella	4 cases
Arsenic Poisoning	18 cases
Visceral Gout	3 cases
Management (chilling, etc.)	194 cases

This represents a considerable amount of work being undertaken with poultry, and although obviously of growing importance does not yet warrant the employment of a professional officer full time.

Coccidiosis is one of the most important of our diseases especially among young birds—it is most probable that the figure shown above represents only a small proportion of the losses for which this condition is responsible. We cannot stress too heavily the importance of good management and hygiene in combating this disease.

Tumours, that is, visceral and neural lymphomatosis, are responsible for very heavy losses and as yet no attempt appears to have been made by the poultry breeders to eliminate this condition.

Bad management is also responsible for heavy losses, especially is this so in young chicks. In a large number of cases this is due to the inexperience of the handler and is not necessarily because of weak or diseased chicks.

Histomoniasis shows a definite increase — owners of affected flocks are advised to use one of the various commercial products now available, either as a premix if the condition is recurrent, or in the drinking water if it is diagnosed for the first time on the premises. The condition appears in young birds only, and is considered to be of relatively limited importance.

Two outbreaks of heavy mortality amongst ducks and turkeys were found to be caused by arsenical poisoning.

The first, among ducks at Henderson Research Station, was due to water contamination —the source was not determined.

The second was among turkeys, on open range, in a paddock in which old arsenical dip drums had been washed out some months previously.

PREVENTIVE AND CURATIVE SERVICES

Vaccines and Remedies

The growth of agriculture and the expanding financial returns from it, have been attracting during the last few years an increasing number of firms, producing vaccines, stock remedies, dips, etc., and it is the policy with the Department that whenever a demand can be supplied by a commercial firm at a more economic level to the farmer, we cease to stock that particular product. Tetram, an anthelmintic for sheep and cattle, is one such product which we have now removed from our list of remedies supplied.

At present we have to accept imported vaccines and such products at face value, but it is obvious that in the future, vaccine production and the sale of vaccines, etc., will have to be dealt with entirely by commercial firms with possibly the formation of a special section of the Department, whose duty it will be to test all vaccines used, and lay down regulations for the production of such.

The major energies of the Department will then be directed to research projects capable of giving more lasting and greater financial returns to the farming community than the production and sale of vaccines. A large commercial firm is at present engaged in setting up an extensive vaccine production unit in Kenya, and is undertaking production of vaccines previously supplied by the veterinary department there.

Quarter Evil Vaccine. This year has seen a new high level in the sale of Quarter Evil vaccine — 464,115 doses being sold. In addition, 31,060 doses of mixed Quarter Evil - Malignant Oedema vaccine were also sold.

At present we are producing both these vaccines, but the mixed vaccine is only issued on request to those areas where we recognize Malignant Oedema as having occurred. There are still many farmers, however, who only vaccinate during the weaner year. While this policy undoubtedly goes a long way towards checking the disease it is not enough to ensure adequate immunity — revaccination at least once, but preferably twice, after the lapse of a year is strongly advised. Sheep are susceptible to this condition as well as cattle, but normally are not vaccinated unless an outbreak has occurred on the premises. Four hundred and eighty doses of sheep vaccine were sold.

Horsesickness Vaccine. A decrease has again been recorded in the number of horses vaccinated, only 3,141 doses of vaccine being sold.

Redwater and Gallsickness Vaccine and Immunization of Cattle. A total of 72 cattle passed through the Laboratory Stables, of which 52 were tuberculin tested and 60 were vaccinated against redwater and gallsickness. The following were the countries of origin and the various breeds:—

Countries: 27 ex United States of America, 23 ex United Kingdom, 15 ex Union of South Africa, two ex Northern Rhodesia and five ex Southern Rhodesia.

Breeds: Santa Gertrudis 17, Ayrshire 12, Jersey 11, Brahmin 10, Friesland eight, Shorthorn six, Hereford five and Afrikander three.

This total represents a considerable drop in the number of animals received — last year 142 animals passed through the stables.

Six hundred and thirty-one smears were examined from animals vaccinated at the Laboratory, and 506 from animals vaccinated on the farms.

A total of 7,324 doses of mixed redwater and gallsickness vaccine and 19,804 doses of gallsickness alone, were issued. The whole of the gallsickness vaccine and over 3,000 doses of the combined vaccine were issued to large ranch combines for use on the weaner stock.

Contagious Abortion Vaccine. Sixty-one thousand seven hundred and sixty-two doses of this vaccine were sold this year representing a negligible increase — about 500 doses — on last year.

We advise all farmers and ranchers to calf hood vaccinate their stock irrespective of the presence or absence of the disease in their herds. Under our ranch conditions, spread of this disease is slow, but it can cause quite considerable calf losses; in the dairy herds, of course, it is a much greater risk and as with Quarter Evil this is a vaccination which must be undertaken.

Anthrax Vaccine. A considerable increase occurred in the amount of this vaccine used; 153,970 doses as against last year's total of 70,690. By far the greater proportion of this vaccine was again used in the Native Reserves. It is laid down as policy that on infected premises vaccination of all stock shall be undertaken for at least three successive years.

Calf Paratyphoid Vaccine. Twenty-two thousand four hundred and eight doses represents an increase of approximately 15,000 on last year's sales — this was principally due to the use of the vaccine by a large ranching concern in an endeavour to reduce calf losses.

Four hundred and twenty doses of adult paratyphoid vaccine were sold.

Blue Tongue Vaccine. The rising interest in sheep is reflected in the increased demand for this vaccine — 3,050 doses being sold.

Enterotoxaemia Vaccine. Showed an increase of approximately 1,000 doses to 3,950 this year.

Rift Valley Fever Vaccine. The recognition of the losses from abortion attributed to Rift Valley Fever has led to an increased demand for this vaccine — 4,775 doses being sold.

Fowl Pox Vaccine. Two hundred and eight-eight thousand doses sold.

Fowl Typhoid Vaccine. Only 580 doses of this vaccine were distributed and we have now ceased production, preferring to advise farmers to combine good hygiene with short interval spot agglutination testing. The efficacy of this latter method was demonstrated most effectively in clearing up an infected flock of approximately 1,500 birds where infection had previously lingered sporadically over a period of six months or so.

Remedies. Two hundred and fourteen gallons of teram and 1,076 tins of nodular worm remedy were sold. As previously stated the increasing number of commercial firms now stocking such remedies has tended to reduce the usefulness of such a service.

ARTIFICIAL INSEMINATION — REPORT SUBMITTED BY MR. R. M. ROBERTS

Salisbury Centre Conception Rates

Quarter	*No. of First Inseminations*	*Non-return at 3–6 Months*	*Conception Rate expressed as %*
October–December, 1956 . . .	336	241	71·7
January–March, 1957	224	160	66·1
April–June, 1957	210	135	64·2

Staff. All three inseminators are fully trained and experienced. The A.I. service is under the supervision of a Veterinary Officer who is also engaged in field investigations of bovine infertility.

The number of inseminators employed is minimal for present requirements and any expansion of the service will of necessity mean more inseminators.

Bulls. The Stud, within the year, has been reduced to three Friesland and one Jersey. Now that the Bulawayo sub-centre is operating entirely on deep frozen semen, this number of bulls is sufficient for present requirements. In the event of the extension of the service to another sub-centre, another Jersey bull will be essential, and another Friesland very desirable — assuming that any new centre will be operating on fresh semen and that there is a demand at the centre for Jersey semen.

The Development of A.I. in Southern Rhodesia. There is no doubt that both on the grounds of livestock improvement and disease control much wider use should be made of A.I. in Southern Rhodesia and that the demand should be increasing more quickly.

Testing for vibriosis is revealing a high incidence of this disease and it is recognized throughout the world that A.I., employing bulls proven to be vibrio-free and properly trained personnel, is the most important weapon for combating this disease. The disease is responsible for very considerable economic loss in an insidious way.

Whilst owners can collect from clean bulls on their farms and inseminate their own cattle the system has many objections and dangers. A.I. at an economic price from a properly controlled centre under veterinary supervision is the only real answer to vibriosis.

The present high cost of A.I. to farmers who are not under Epi-Vag restrictions is quite obviously retarding its development and requires to be reduced. Farmers whose herds are under Epi-Vag restrictions obtain the service at a greatly reduced rate, as they are not charged mileage. Consequently it is such farmers that form the backbone of the service.

It says much for the service that the number of inseminations on farms other than those under Epi-Vag restrictions has increased in the year under review. However, it must be pointed out that the number of farms under restrictions is showing a steady decrease and that farms, on being released from quarantine, often continue to make use of A.I. until the cost becomes prohibitive.

Bulawayo shows an increase in inseminations carried out, but very much wider use of A.I. should be made in this area. One of the factors retarding A.I. from this sub-centre is that there are fewer farms under Epi-Vag restrictions than in the Salisbury area.

The Extension of the Use of Deep Frozen Semen. Since 28th August, 1957, the Bulawayo centre has been operating entirely on deep frozen semen. The present arrangements for storing deep frozen semen, both at Bulawayo and Salisbury can, however, only be regarded as makeshift and temporary.

The ideal system in Southern Rhodesia would be to operate the entire service on deep frozen semen. This would be practical for Salisbury and all other sub-centres on the main railway line. Proper storage equipment and a guaranteed weekly supply of dry ice would be necessary. The advantages of this system would seem to offset the cost of installing storage equipment, and the cost of storage using dry ice.

The latest method of semen storage employed, which claims that results after seven days' storage at room temperature are as good as these with "first day" diluted semen, is at present being tried out. The method offers tremendous advantages to Southern Rhodesia and we are hopeful that it will be successful. Even so, several main centres operating with deep frozen "banks" should form the basis of the service, on account of the many advantages such "banks" would afford.

The Decline in the Numbers of Doses Issued to Farmers. For many reasons the system of issuing semen to individual farmers has not proved successful and the only future development of A.I. which can be envisaged is by employing properly trained personnel operating from A.I. centres at economic rates.

It is recommended that this scheme should cease to be made available to any new participants and that attention should rather be given to extending the service along the lines given below.

The poor results obtained by farmers with semen supplied from Salisbury tends to bring A.I. generally into disrepute. It is possible, however, that many of these poor results are due more to errors in storage technique on the farm than to poor semen.

The results obtained by our own inseminators show that A.I. is practical, and can be successful, under Rhodesian conditions.

Doses of Semen Used

	1956–57	1955–56
(*a*) Salisbury Inseminator	2,318	1,869
(*b*) Bulawayo Inseminator	531	72
(*c*) Supplied to Farmers	641	973
(*d*) Veterinary Dept., Animals	56	74
TOTALS	3,546	2,988
Total doses Freisland semen	3,019	2,534
Total doses Jersey semen	527	454
TOTALS	3,546	2,988

Comparison of Semen Used by Inseminator on Epi-Vag Farms and Other Farms

	Salisbury		*Bulawayo*	
	1956–57	1955–56	1956–57	1955–56
(*a*) Epi-Vag Farms	1,031	1,112	270	44
(*b*) Other Farms	1,287	757	261	28
TOTALS	2,318	1,869	531	72

Details of Mileage Covered, 1956-57

	Salisbury	*Bulawayo*
(*a*) Veterinary Dept., Animals	494	—
(*b*) Epi-Vag Farms	15,560	7,120
(*c*) Other Farms	15,506	3,857
TOTALS	31,550	10,977

Revenue, 1956-57

Mileage: 19,363 miles at 1/- per mile	£968	3	0
Inseminations: 2,759 doses at 15/- per dose	2,069	5	0
Inseminations: 90 doses at £1 per dose	90	0	0
Semen issued: 638 doses at 15/- per dose	478	10	0
Semen issued: 3 doses at £1 per dose	3	0	0
Railage	25	7	2
TOTAL	£3,634	5	2

INVESTIGATION AND RESEARCH

Low Fertility in Ranch Cattle

1. *Nutritional Level of Cows in Calf.* Examinations during the last few years have shown that it is possible to achieve approximately a 96 per cent. pregnancy rate when Afrikander heifers

are put to the bull at three years of age. The following year the pregnancy rate in these same animals drops to the region of 55 per cent. Last year we showed that by feeding cows in calf during the dry season the subsequent pregnancy rate could be raised by 9 per cent. Last year heifers which had shown a 96 per cent. conception rate were grazed during the dry season on the poorest Charter sand veld, a conception rate of only 38 per cent. was the result.

2. *Loss of Calves.* Previous results have shown a considerable drop between the conception rate as estimated by rectal examination and the actual calving rate from a physical count. One hundred heifers were therefore selected, checked and found to be 96 per cent. in calf. These animals were closely supervised during the calving season with the following results:—

Calves born alive	90
Calves born dead	4

One calf was drowned at birth and one calf was not found although the cow obviously had calved.

Diagnostic material was removed from the still-born calves and forwarded to the Laboratory for examination. Tests for contagius abortion, vibrio fetus, trichomoniasis, Rift Valley fever, Wesselsbron and arsenic poisoning were all negative.

At eight months of age 90 calves were weaned in this group of 100 heifers.

It is of interest to record that during this year on Charter ranch where the above work took place the actual calving rate in approximately 3,600 cows was 72.9 per cent. while the weaning rate was 71.5 per cent.

3. *Animals with Dormant Ovaries.* This is one of the most important factors concerning this question of low calving rate. Examination has shown that 55 per cent. is the usual conception rate in cows, and that of the 45 per cent. not in calf over 30 per cent. showed non-functioning ovaries.

A pilot experiment undertaken during the last six weeks of the breeding season showed that practically no difference existed between a control group and groups fed vitamin A and bone meal.

The important factor is considered to be that the length of the period between calving and the subsequent bulling period is too short to allow recovery from the loss of weight sustained during the dry season and the drain of bearing a calf and the supplying of milk to it. Further work is now in progress to compare the effect of supplying (a) vitamin A (b) bone meal and (c) two pounds concentrates for a period of six weeks prior to the commencement of the calving season—the results, however, will not be available until after this wet seasons bulling period. There is obviously an economic nutritional level at which ranch cows must be fed to obtain a high calving rate. While acknowledging the overall protein deficiency that must exist during the dry season we know that since 55 per cent. of cows have calves on two successive seasons it is not necessary to feed throughout the dry season. It is maintained that by selective feeding, and that term selective refers to the time of feeding as well as to the type of feeding, we may find a more economic method of raising our calving level than by straight protein feeding throughout the dry season.

The comparison between cows fed during the dry season, and cows not fed, is still being continued. The feeding consisted of supplying ten pounds of silage per head per day from June until October in 1955, 1956 and 1957.

The pregnancy rate in 1955 was 91 per cent. in both groups and the not in calf animals were removed from the experiment.

	Fed Group	*Non Fed Group*
In calf May 1955	91	91
Cows registered as having calved	79	86
Calves weaned 1956	75	76
Number of cows in group in May 1956	91	91
In calf May 1956	67	55
Ovaries functioning but not in calf	2	1
Non functioning ovaries	22	35
Cows registered as having calved	63	53
Calves weaned 1957	59	53
Number of cows in group in May 1957	90	89
In calf May 1957	83	71
Ovaries functioning but not in calf	4	8
Ovaries non functioning	3	10

It is extremely interesting to note the variation in pregnancy rates between the two groups in the 1956-57 and 1957-58 figures as set down below.

	1955/56	1956/57	1957/58
Fed group	91%	73%	92%
Non fed group	91%	60%	79%

It would appear, however, that the effect of winter feeding has not yet been able to flatten out the usual pregnancy rate variation as can be seen from the fact that the difference is 13 per cent. for both the 1956-57 and 1957-58 seasons.

Aphosphorosis. The work in ranch infertility being undertaken by the research department has shown in general terms the effect of nutrition on fertility and while conceding the extreme importance of protein it is considered that such minerals as cobalt and phosphorus are also of importance.

The work of Theiler, Green, and others at Onderstepoort, demonstrated the importance of phosphorus in improving the fertility of the breeding bovine. Various analyses of veld grasses during the last 15 years have shown the phosphorus content to be minimal if not actually deficient in some cases. A sub-clinical phosphorus deficiency was therefore suggested as a possible explanation for the low fertility rate in ranch cattle. To investigate the point, Afrikander heifers are being fed sodium monophosphate during the dry season and observations made on the weights, ovarian cycles and on the pregnancy rates over at least two calving seasons. At Charter Estate 200 weaners have access only to phosphate treated drinking water and are being compared with 200 weaners under normal ranch conditions. Weight increases, ovarian function, and fertility will be recorded. Cows in calf are being fed sodium monophosphate for at least six weeks before calving to ascertain the effect on ovarian function and fertility during the following bulling season.

Reports from the ranches in the Shangani area this dry season gave the clinical picture of a phosphorus deficiency in cows with calves at foot and investigation by members of the Field Staff resulted in the forwarding of blood samples for examination. This showed the presence of a definite phosphorus deficiency in the blood serum, the average content being 2.26 mgm. per 100 cc. in 13 cows. The average for lactating cows is 3.2 mgm. per cent.

The condition showed an almost immediate response to the feeding of sodium monophosphate.

One of the simplest methods of administering the phosphate is in the drinking water and at least two commercial firms operating in the Federation have produced mechanical contrivances capable of doing this. While many ranchers have commenced the feeding of phosphorus to their stock it is obvious that a survey of the situation is required in order to make the most economical use of the addition of phosphorus to the ranch animals diet.

Mastitis. During the last few years there has been a considerable increase in the number of mastitis cases said to be resistant to the usual antibiotics in use and in some herds this was said to be assuming alarming proportions, where owners were expending, uselessly, considerable sums each month on antibiotics.

This year owing to staff increases it was possible to have some of these outbreaks investigated.

It is extremely interesting and important from the view of the Dairy Industry to know whether the unrestricted farmer use of antibiotics has changed the causal flora in the mastitis picture.

The basic objectives in the investigation of these mastitis outbreaks have been (a) to determine the etiological agents involved (b) to detect or treat carrier cows and (c) to advise on improved methods of management, milking technique and hygiene.

One outbreak in the Salisbury district, which had been in existence for sometime before Laboratory help was sought, proved to be staphylococcal mainly, with a few streptococcal cases—the latter were rapidly eliminated by testing and treating. The staphylocaccal cases were only brought under control after two months of repeated treatment and strict attention to correct methods of management, milking technique, and hygiene. In the Marandellas area a severe sudden outbreak was found to be due to Streptococcus agalactia and a "blitz" treatment of the entire herd of 80 cows, which at the time were over 40 per cent. infected, was undertaken with penicillin. Subsequent tests and treatments showed a continued reduction in the number of carriers until, at the end of ten weeks, there were only three infected cows of which two were long standing badly indurated cases. The costs involved in this outbreak from direct and indirect milk loss, drugs used etc., were estimated at over £500.

Numerous individual samples submitted by members of the Field Staff, practitioners and farmers have been examined and it would appear that despite the intensive intramammary use of antibiotics, Streptococcus agalactia is still responsible for a very large proportion of our mastitis cases.

We advise all farmers who use antibiotics in the treatment of mastitis not to use or sell milk from treated cows for at least 72 hours after the completion of a course of treatment, in view of (a) the possible effect on humans consuming such milk and (b) the effect on milk by-products, such as cheese. The Dairy Marketing Board report that cheese makings is a more lengthy process during the wet season—it is possible that the presence of penicillin treated milk may account for this fact.

Poisoning. An outbreak of Lantana camara poisoning among a herd of dairy cattle in the Salisbury district was investigated during the dry season.

The herd consisted of 48 dry Friesland cows and heifers which had been running on a couch grass paddock (Cynodon dactylon). The grass was very dry at that time of year and the only supplementary feed available was veld hay in the form of a stack.

A large number of L. camara shrubs were present and these exhibited signs of having been heavily browsed. Three days of severe frost had been recorded prior to the first case being reported. Out of the total of 48 animals 37 became clinically affected of which 11 subsequently died or were slaughtered in extremis and three cows aborted.

Typical symptoms shown were—marked weakness, depression and tendency to seek the shade, recumbency in the latter stages and generalized icterus. Nasal and lachrymal discharges were present and ruminal atony and constipation was general. Several exhibited lesions of mild photo sensitivity, especially of the unpigmented skin along the back and on the teats of the cows—the latter especially appearing swollen, cracked, red brown and very sensitive. It was considered that the more chronic cases developed more severe lesions of photo sensitization.

A laboratory heifer—in good condition and weighing about 400 lb.—was dosed with six pounds of fresh unfrosted minced leaves and berries but failed to produce any symptoms, although kept under observation for five days in an open paddock. It is thought that frosting may play a role in increasing the toxicity of Lantana.

Phalaris Staggers in Sheep. An outbreak of phalaris staggers occurred among sheep grazing on an irrigated phalaris pasture on Grasslands Experimental Station, Marandellas. As the symptoms only appeared first in ewes with lambs at foot, it was considered relatively safe to put young growing cattle on the pastures. Within three weeks these had to be removed owing to the appearance of symptoms.

Australian workers dealing with this condition, have suggested it is due to a nerve toxin produced by phalaris species which is, under normal conditions, neutralized by vitamin B 12 produced in the rumen. On certain types of soil, either the lack of cobalt or inability of the phalaris species to remove enough cobalt from the soil leads to a deficiency of vitamin B 12 with consequent appearance of the staggers symptoms. Even although prompt removal of the sheep leads to a diminution in the severity of the symptoms, there is in the large majority of affected cases a progressive loss of condition and finally death, possibly several months after the initial symptoms have subsided.

The typical staggers syndrome commences with an involuntary movement of the head—rather like a continuous nodding. When the animal is frightened it attempts to gallop with both hind feet together and usually falls down within a few yards, showing greatly accelerated respirations and heart beats. If not hurried the animal is able to move normally. Over a period of time, which may be as long as six months, there is a progressive deterioration in condition although the constant nodding of the head may be reduced almost to vanishing point.

A pilot trial set up with cattle, where the animals were constantly grazed on plots consisting in the major part of phalaris species, showed that only where the plot had been sown with cobalt salt at the rate of four pounds per acre were no symptoms noted. Where the animals were treated with 500 units of vitamin B 12 every second day, or had access to salt plus one per cent. cobalt sulphate, symptoms appeared within three weeks in the first instance and in about seven weeks in the latter.

Although this phalaris species has been in common use throughout the country during the past two years, no adverse comments have previously been voiced. It is considered from the Australian work that such factors as rate of growth, type of soil, and availability of other feeds are important.

Internal Parasites in Sheep. The introduction of irrigated pastures and of pasture regeneration of tobacco lands, has led to increasing interest in sheep. In view of this a programme of investigation of parasitological problems was drawn up which unfortunately had to be greatly curtailed through shortage of staff.

Some of the problems under discussion were investigated by Mr. V. A. D. Browne while on secondment from the Field staff.

Evaluation of the Methods of Examination of Faeces Samples for Fluke, Gastrodiscus and Nematode Eggs. A comparison of various methods was made with the following results.

1. The standard method used in the Laboratory—that is sedimentation and sugar flotation—is, from the points of view of convenience and efficiency, satisfactory for our requirements.
2. Samples taken from the lowest levels of the centrifuged residue contain the greatest number of trematode eggs.
3. Failure to recover trematode eggs is of no significance.

These findings are in agreement with generally accepted criteria.

Control of Fascioliasis with "Carbergan" (May and Baker). This product, containing 25 per cent. Carbon Tetrachloride in arachis oil and administered by intramuscular injection, was used on a group of cattle grazing on pastures said to be fluke infested. Fifteen animals were treated on two occasions at a fortnight interval, nine of these showed no evidence of fluke infection, whereas six had slight evidence of fluke action but no live parasites. In the control group of nine untreated animals, seven showed no evidence of fluke while two had a light infestation with

live fluke. While the results were suggestive it was unfortunate that the general infection rate was not heavier. As the last injection of carbergan was given only 16 days before slaughter no deduction can be made on the efficiency of prevention of infection.

Particle Size and Phenothiazine Efficiency. Farmer complaints of diminution in the anthelmintic efficiency of phenothiazine stimulated this trial, which comprised of two groups of sheep dosed on two accasions at a three weekly interval. A random sample of phenothiazine as at present supplied to the farmer public was compared with Liquid Phenothiazine, kindly supplied by Cooper and Nephews (Pvt.) Ltd., of South Africa. The sheep were to be slaughtered three weeks after the last dosing. The sheep chosen were unfortunately the lamb survivors from the Phalaris flock (mentioned elsewhere in this report) and several of them did not survive the full period of the trial. Since this factor, however, was common to both groups, it should not invalidate the comparison in any way.

The following figures show the total worm count in the various sites in both groups.

	Abomasum	*Small Intestine*	*Large Intestine*
Liquid Phenothiazine	7,800	64,500	410
Stock Phenothiazine	26,401	109,800	1,422

These figures do indicate considerable superiority of efficiency of liquid phenothiazine.

The following species of nematode worms were found to be present.

Abomasum. Haemonchus contortus and Ostertagia circumcincta.

Small Intestine. Trichostrongylus colubriformis.

Large Intestine. Oesophagostomum venulosum (there was indication in both groups of heavy nodulation but relatively few free worms were observed).

Agalactia in Sows (Mammary Hypoplasia). On the recommendations of the Agalactia Committee an experiment was conducted at the Laboratory to test the agalactia producing properties of (a) heavy concentration of D.D.T. and (b) munga from the Fort Victoria area and (c) munga from the Pig Industry Board.

Twenty Large White gilts were divided into four groups for the purpose of the experiment and fed special rations during the full gestation period.

Group I. *Controls* Ration A, D.D.T. content analysed as 0.027 per cent.

Group II. *D.D.T.* Ration A, D.D.T. content 0.15 per cent.

Group III. *Fort Victoria Munga* Ration A, concentrate two parts, plus munga three parts, also D.D.T. content 0.06 per cent.

Group IV. *P.I.B. Munga* Ration A, concentrate two parts, plus munga three parts, also D.D.T. content 0.06 per cent.

Ration A was a 15.8 per cent protein ration on which no case of agalactia had been recorded.

Ration A, concentrate, was the maize and munga free concentrate of the above ration.

Fort Victoria Munga was munga from Fort Victoria area of unknown agalactia producing qualities.

P.I.B. Munga was munga of considered agalactia producing properties.

Group	*Total pigs in litters*	*Surviving at 14 days*	*Mammary hypoplasia*
I (Control)	43	35	0
II (D.D.T.)	45	33	1
III (Fort Victoria Munga)	55	0	5
IV P.I.B. Munga	46	13	5

Unfortunately the farrowing pens available were not entirely suitable, and in addition a large number of these sows farrowed down in July and August during a period of cold weather which resulted in a loss of piglets until infra red lamps were provided. As the farrowing of three of the group IV sows—P.I.B. Munga –are included in this period it was difficult to judge as to the exact cause of death of the piglets, since cold and exposure rendered the piglets less able to suckle, and in the absence of that necessary stimulus, milk secretion quickly died away in the sows.

One sow in group II—D.D.T.—farrowed in the pen with other sows and was savaged and her piglets died.

The results of the experiment, however, were considered to be conclusive on two points (1) that D.D.T. at the rate fed i.e. 0.15 per cent did not produce agalactia and (2) that munga as fed did produce agalactia.

Post Parturient Metritis. During the year a further condition causing piglet losses appeared, which was in many cases confused with the typical mammary hypoplasia—this has been termed febrile agalactia, but is rightly a post parturient metritis. The condition usually commences with a rise in temperature shortly after parturition, a grey white coloured discharge from the vagina and a marked hardening of the udder—usually more pronounced posteriorly. The udder, which

is very well developed, becomes very congested and the animal is usually prostrate and unable to feed her piglets.

The cause is thought to be coliform infection of the uterus following parturition with the development of a septicaemia and consequent udder involvement. Considerable success in controlling this condition was obtained following the introduction of a coliform vaccine and serum produced by Bayers. It was recognized however, that complete cover would not be obtained with the use of a coliform vaccine since other organisms such as Corynebacterium pyogenes and Streptococci were also involved in such uterine infections. One method of control suggested and used effectively on at least one farm was the use of terramycin pessaries following parturition. The use of sulphamethazine within 24 hours of farrowing also gave good results. Messrs. Bayers were interested in the production of a vaccine from organisms specifically isolated from such cases and deep uterine swabs and milk samples were therefore taken from available cases and the isolated organisms forwarded to their laboratories. These swabs showed considerable variation in the type of organism present. During the agalactia experiment already referred to therefore, uterine swabs were obtained from the majority of the sows which farrowed down, although none of them showed evidence of post parturient metritis.

The results of this survey are shown in the following table.

Haemolytic streptococcus	—	17 sows
Non haemolytic streptococcus	—	2 sows
Non haemolytic staphylococcus	—	2 sows
E. coli (non haemlytic)	—	15 sows

Bovine Abortion. A survey into the causes of bovine abortion has been undertaken during the year. This was stimulated by the infertility work previously referred to, where figures of conception rates differed considerably from actual calving rates. Eighty-four specimens of aborted bovine foetuses were examined, in 55 cases complete foetuses were received at the Laboratory while in the remaining cases only material such as liver, brain, stomach etc., was available.

A diagnosis of the causal agent of the abortion was reached in 21 cases—the following list gives the detailed diagnoses.

Rift Valley fever	8
Brucella abortus	2
Vibrio fetus	2
Yeasts	2
Fungus	1
Streptococcus	1
Corynebacterium	1
Salmonella enteriditis	1
Babesia bigemina	2
Lantana poisoning	1

The material examined represents only a very small proportion of the abortions occurring, being drawn in most cases from dairy herds in the Salisbury area. No differentiation was made between abortions and still-born calves.

The following tables shows the monthly distribution of the abortions and the diagnoses.

	Oct.	*Nov.*	*Dec.*	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May.*	*Jun.*	*Jul.*	*Aug.*	*Sept.*
Material Submitted	2	1	8	2	1	5	10	8	8	16	14	3
Diagnosis Made	1	0	0	0	0	3	5	4	2	3	2	1

It is difficult to assess the reasons for the rise in actual abortions during December, April and finally July and August, especially as during the December and July-August period there was no corresponding rise in the actual diagnosis made.

The rise in diagnoses during the April period was due to the insect transmitted Rift Valley fever.

It is of extreme interest to note the relatively low proportion of abortions attributable to Contagious Abortion.

The necessity for an extension of this work is very obvious. One great difficulty is to obtain sufficient specimens; only by active propaganda can we convince the farmer that it is worth while bringing a foetus in to the Laboratory, or otherwise contacting a government veterinary surgeon who will collect the necessary specimens and forward them to us. In order to cover each specimen for bacterial, viral, protozoal and other possible causal agents, we require, in addition to portions of the foetus, a blood sample and a blood smear from the aborting cow.

Rift Valley Fever. While the presence of Rift Valley Fever antibodies in bovines in this country was recognized in 1955 in connection with abortion outbreaks, we have this year isolated the virus from several cases of bovine abortion and from other specimens. The isolations were obtained in day old mice by the intracerebral and intraperitoneal routes from specimens forwarded to the Laboratory and the mouse brain material then used as a source of antigen for the serum — virus neutralization and pathogenicity tests.

Eight strains were isolated from aborted bovine foetal specimens, one strain from a lamb liver submitted during an outbreak of heavy sheep mortality and one strain from human serum from an accidental laboratory infection. The period of isolation of these strains ran from March to June — that is, from towards the end of the wet season until the cold weather eliminated the insect vector.

In addition a further case of Rift Valley Fever was diagnosed by quantitative tests on acute and post phase sera obtained from a veterinary surgeon who had been in contact with one of the outbreaks from which virus had been isolated.

Contagious Infertility. In view of the suggestion that dipping with arsenic might produce testicular lesions in bulls, similar to those found in contagious epididymitis, trials were carried out at the Gwebi Station.

Attempts were made to scald the skin of the scrotum, firstly by applying arsenic as a wash in various strengths which included 0.16 per cent., 0.24 per cent., 0.32 per cent. and finally 0.5 per cent. Finally these concentrations were applied to a sack tied round the scrotum and left in position for two to three hours. Slight swelling did occur, but usually necrosis supervened commencing where the sack had been secured. Three bulls had to be destroyed because of these necrotic lesions.

Dipping in 0.24 per cent. arsenic was commenced and was carried out at four day intervals — various types of bulls were used, namely, Hereford, Friesland and Afrikander. We were unable to produce testicular scalding, but one bull died from arsenical poisoning.

Several attempts at virus isolation in baby mice were made, using fresh material from cases of contagious infertility in both sexes. No positive results were recorded.

Vibriosis. The vaginal mucus agglutination test using the Weybridge technique was put into operation towards the end of July, 1957. Previous to this a number of samples had been submitted to the Central Veterinary Laboratory, Weybridge, England. Results obtained from these were confirmed at Salisbury using our own test.

The test is delicate and has had some teething troubles necessitating duplication of work, etc., and an acute shortage of technical staff did not improve matters. The test is now on a more stable basis and the chief drawback lies in the preparation of antigen for the production of which only limited facilities are available at present. We hope that an improvement in the technical staff position and the provision of more of the required equipment will circumvent our present difficulties.

The antigens which have been used to date are Weybridge 1980, and Onderstepoort 62. Results with the latter have been much more definite and there is no doubt, from the results, that they are highly significant.

One of the difficulties with vibrio fetus testing is that different strains occur in different parts of the world, and that most laboratories employ local strains of high antigenic value in addition to those accepted elsewhere. In Denmark, for instance, three strains, Danish, British and American, are employed as a routine.

We are at present testing out our local strains and will continue to test strains from other sources. This all involves extra work and can only proceed slowly with the facilities available. In the meantime we will continue using "1980" and "62" which are producing highly significant results and may well prove to be as good as any other strains.

Results Obtained by Mucus Testing

	No. of Herds Tested	*No. of Herds Positive*
Herds other than "Epi-Vag"	10	6
Epi-Vag herds	7	3
TOTALS	17	9

Herds in which Results have been Confirmed by Actual Recovery of the Organisms from Aborted Foetuses or from Recently Infected Females using the Danish Biopsy Technique: Herds other than Epi-Vag, 1; Epi-Vag Herds, 2.

It must be pointed out that the recovery of the organism in these cases was either incidental or occurred when an attempt was made to prove certain bulls infected. The demonstration of agglutination in a herd is sufficient to confirm the presence of infection.

In addition to the above herds, infection was established in one non-epi-vag herd by the recovery of the organism from a foetus and from a recently infected female. No mucus tests were undertaken.

In the year under review the organism has twice been isolated from the foetal material submitted to the laboratory.

Number of Bulls Proved Infected by Isolation of the Organism from Infected Virgin Females. During the course of the work we have had occasion to test nine bulls by the Danish technique and have proved four to be infected. Tests were carried out on six females mated to these four bulls and the organism was recovered from all six females.

We now have four local strains in pure culture.

The Significance of the Results in Epi-Vag Herds. On account of the tendency in South Africa to associate Vibriosis with this condition, the tests carried out in Epi-Vag herds were, in five

of the seven herds examined, undertaken solely to determine whether vibriosis was a constant feature in our Epi-Vag herds. The results prove that vibriosis is not a constant feature in our Epi-Vag herds, but they also show that much of the infertility in our Epi-Vag herds previously attributed to Epi-Vag, is in fact due to vibriosis.

Trichomoniasis. Four samples from two herds sent to Weybridge, for mucus agglutination test — both negative. History was not very suspicious in either case.

MISCELLANEOUS

Sir Thomas Dalling, Veterinary Advisor to F.A.O., Rome, visited the Federation during the year, making us conscious once again of the necessity for closer contact with advancing veterinary opinion.

Situated as we are, relatively remote from acknowledged veterinary advancement, it is difficult to keep abreast with modern trends unless we receive such visits or can send our staff to progressive veterinary schools and institutes.

I wish to thank the staffs of the other departments for the willing help and co-operation given during the year.

I am deeply appreciative of the enthusiasm shown by the various members of my staff during the year reviewed above.

G. J. CHRISTIE,
Acting Assistant Director of Veterinary Services (Research).

REPORT OF THE ACTING DIRECTOR OF TSETSE AND TRYPANOSOMIASIS CONTROL AND RECLAMATION FOR THE YEAR ENDED 30th SEPTEMBER, 1957

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   - (d) Bush Clearing.
     - (i) Rengwe River System.

6. TRAFFIC CONTROL.

7. ROADS.

8. HUMAN TRYPANOSOMIASIS.

9. ACKNOWLEDGEMENTS.

1. INTRODUCTION

Further progress was made during the year in implementing the recommendations of the Commission of Enquiry on Human and Animal Trypanosomiasis in Southern Rhodesia, culminating in the appointment as Director of Mr. John Ford on September 27th, 1957. Mr. Ford was formerly Director of the East African Trypanosomiasis Research Organization.

The policy of changing the emphasis of game destruction as the main method of combating tsetse in Southern Rhodesia has been developed further. This year 18,003 animals were killed, compared with 34,208 last year and 41,576 in the previous year.

An aerial spraying campaign has been concluded in the Sebungwe District involving the treatment of approximately 100 square miles of tsetse infested woodland.

The Border Clearing in the Chipinga District has been extended from Beacons 96 to 100. A heavy concentration of *G. morsitans* along the Rengwe River in the Western Urungwe has disappeared almost completely, following the clearing of the riverine vegetation along the Rengwe and its tributaries. The settlement of Africans adjacent to the cleared areas is likely to consolidate the gains made.

The game fence on the west bank of the Sabi River has been completed by the contractor. In the Sebungwe district a game fence approximately 100 miles in length was built by the department, and the extension of the cattle fence along the Central Road was completed by a contractor. Game fences are now under construction in the Sabi East Bank and North Urungwe districts.

More traffic control points have been established and efforts have been made to institute a uniform procedure for handling traffic. A new cleansing chamber was installed at Vuti on the new Chirundu-Karoi road. A Swingfog machine is operating at the important Mzola gate in the Sebungwe.

Surveys have been made of little known areas adjacent to our areas of operation to extend our knowledge of the distribution of Southern Rhodesian tsetse.

We are still greatly understaffed. It is becoming increasingly difficult to keep men of the right calibre under bush conditions.

2. DISTRICT REPORTS

(a) Urungwe

(i) *Urungwe Native Reserve and Karoi Farms.* The decline in the numbers of tsetse taken at the traffic control points continues, despite a general increase in traffic. It is noteworthy (see Appendix) that again no tsetse were taken in the eastern part of the Reserve or from traffic coming from there, and that only 17 *G. morsitans* were taken from eastbound traffic at the Central Fence compared with 55 for last year. Chiroti Gate in the Western Fence which has always contributed by far the largest catch of tsetse for these gates, has yielded 235, compared with 565 for last year. On the other hand, Zemaiwe Gate in the Western Fence gave an increased catch from 38 *G. morsitans* last year to 74 this year, all from eastbound traffic. This circumstance will be referred to below (see Rengwe Clearing).

Settlement of Africans displaced from the Zambezi Valley as a result of the construction of the Kariba Dam, and of others moving from overcrowded reserves or from Crown Lands has begun to change the appearance of the reserve. There is little doubt that the better communications and greatly increased settlement have contributed largely to the disappearance of game, and with it the tsetse. However, before settlement in the Reserve can be said to form a barrier to the extension of the tsetse from the Sanyati Basin, the north-western portion of the Reserve north of the Kanyati must be developed and occupied.

There is little game in the western portion of the Reserve. Baboons, warthog, bushpig and duiker formed 96 per cent. of the 1,487 animals killed in our operations in the western portion of the Reserve.

No cases of trypanosomiasis were recorded from livestock within the Reserve. The two bait oxen kept by this Department at Magunge were moved to Zwipani in the western part of the Reserve without ill effect, but after they had been moved out of the Reserve westwards to the Rengwe River area they both became infected with *Trypanosoma vivax*.

Nine cases of infection with *T. vivax* and nine with *T. congolense* were recorded from the Karoi and Miami farms, with one death. These isolated occurrences of disease appear to be related in the case of the Karoi farms to the introduction of occasional tsetses on traffic, and, on the Miami farms, to the movement of cattle towards the known fly-threatened areas to the north.

There is no evidence of any encroachment of tsetse towards the European farms.

(ii) *The Western Section (formerly Dekete Section).* A new camp was established at Deve, in Western Urungwe, during November, 1956.

The traffic control barrier erected on the Chiroti-Sanyati road in July, 1956, to deal with the heavy earth moving equipment using the Sanyati Drift continued to yield valuable information.

G. pallidipes appeared in the records in October and December, 1956, and January, February, June and July, 1957. Repeated searching eventually resulted in locating *G. pallidipes* in typical habitat on the Sanyati River at the drift. Thus another source of *G. pallidipes* is on record.

A bush clearing scheme was carried out on the Rengwe River system with the object of eliminating an important concentration of *G. morsitans*. The removal of the riverine vegetation followed by the settlement of Africans transferred from the Sipolilo area has been accompanied by a marked decline in the local tsetse population (see Section 5 (d)).

(iii) *North Urungwe Section.* Shooting operations in the Chirundu "Strip" were suspended in December, 1956. The Gota Gota camp was closed down in November, 1956. New camps were established near the Chewore River north of Miami and near the Tsororo River, north of the Urungwe Native Reserve during October, 1956.

The major activity in these areas has been the construction of a road along which a game fence will be built. It is intended to build a game fence running from the Sanyati River to the Angwa River to protect the Karoi and Miami farms from incursions of game displaced from the Zambezi Valley by the Kariba Lake.

A new fly cleansing chamber came into operation at Vuti when that section of the new Karoi-Chirundu road was opened to traffic. At Makuti a new gate will be installed when road building activities in the area are complete.

There has been an increase in the number of tsetse taken at Vuti Chamber, probably related to the increase in traffic, to local road building activities and to the great increase in available tsetse along the main road to Chirundu in the Zambezi Valley, but by far the most significant event at Vuti, Catkin, Manyangau and Chirundu barriers this year has been the appearance of *G. pallidipes* in the records. This species has been recorded over wider areas and in greater numbers during the past few years. It probably exists throughout most of the Zambezi Valley in Southern Rhodesia where conditions favour it, and appears to be extending its range above the Zambezi escarpment. This increase in abundance of *G. pallidipes* has also been noted elsewhere in Africa. The position is being reached in Southern Rhodesia where control methods will need to be devised against two species of tsetse instead of the one.

(b) **S.-W. Lomagundi: Eastern Sebungwe**

There has been no apparent change in the tsetse situation in this area. In the Umvumvudzi-Yanse River area adjacent to the Sanyati, *G. morsitans* occurs regularly. Occasionally *G. morsitans* can be taken at Mtungi Pan.

Cattle at Hova remain free of trypanosomiasis.

Surveys carried out by Mr. Goodier revealed high concentrations of *G. morsitans* along the Gungunkwe River and also the presence of *G. pallidipes*. (R. Goodier: "A Survey of the Tsetse Situation in the Western Sebungwe. September, 1957".)

(c) **North Lomagundi**

Following the death of Mr. I. Fraser in December, 1956, Mr. Harwood took over the area. There has been no change in the general situation.

One case of *T. congolense* was reported from Longmead Farm in the Umboe Valley north of Sinoia. No other cases were recorded from the surrounding district and there was no indication of neighbouring farmers having travelled to known fly belts and brought tsetse to the farms. The animal recovered after treatment with Dimidium bromide.

(d) **Mtoko**

While there is evidence of an increase of the *G. morsitans* population in Portuguese East Africa adjacent to the Southern Rhodesian eastern border, and there has been an increase in the catches of this species by our border patrols and at all traffic control points, the trypanosomiasis position in the Mtoko and Chikwizo Reserves remains satisfactory. No cases occurred in the Mtoko or Fungwe cattle, which indicates absence of tsetse from that and adjacent areas. In the Chikwizo Reserve, which is adjacent to the Portuguese Border, trypanosomiasis re-appeared in one animal in October, 1956. Three cases were detected in cattle in January, 1957, three in February, seven in March (also in one donkey) and eight in April (and in two donkeys). On May 10th all cattle were treated with Antrycide methyl sulphate, since when no further cases in cattle have been detected. In June after trypanosomiasis had been found in 27 donkeys, a total of 237 were treated with Antrycide methyl sulphate. The cattle population is now increasing.

(e) **Sebungwe**

The main activities in this area have been associated with aerial spraying, construction of fences and re-organization of traffic control points.

The cattle fence was extended from the Central road northwards to the Rutope River and eastwards towards Lufusi dip. Along the Rutope, the fence was constructed north of the river, to permit the Rutope cattle to utilize the water and grazing along the river.

Surveys carried out along the Rutope River indicate that tsetse are not established on that river east of its confluence with the Lutotschwana River, and that the occurrence of trypano-

somiasis in the Lutope cattle is more likely to be associated with the existence of tsetse on the Sengwa River and its tributaries.

A game fence was constructed by our own staff from the Mlibizi River in the west to a point north of Ngomeni on the Sengwa in the east, a distance of approximately 98 miles. Materials and African labour costs amounted to approximately £66 per mile. The shooting area is now bounded on the north by a game fence and in the south by a cattle fence. The area will be divided into sections each under the control of a Tsetse Field Officer provided with a selected team of African hunters. Hunting operations were discontinued during the construction of the fence.

Surveys carried out by Mr. Brayne, entomologist, in the Siambola-Cewali area have shown the importance of the headwaters of the Nagupande River as a source of the *G. morsitans* associated with the Siambola-Cewali road and the Dongamusi River area. Tsetses were caught, marked and later released on the Siambola-Cewali road and at the Bemsee River. Recaptures made at traffic control points and on patrols indicated that tsetse could be carried for several miles along the Siambola-Cewali road on traffic, that they could move around, or be carried through the traffic control points and, more important, confirmed that the headwaters of the Nagupande River provided a source of the tsetse found on the Siambola-Cewali road. It is interesting to note that one *G. morsitans* was taken at Dandanda Pan on the Mzola River, about 20 miles across country from its point of release. It became evident also that the small fly population along the Mzola River is supplemented by migrants from the Siambola-Cewali road.

The native owned cattle in the infected areas of Lupani, Gokwe and Binga districts have been kept under treatment with Antrycide methyl sulphate at two monthly intervals by the Trypanosomiasis Unit of the Veterinary Department. No cases of trypanosomiasis have been recorded in these cattle since treatment began.

Treatment of the cattle in the old infection sites of the Kana River area was discontinued in July. The improved surveillance of traffic for carried tsetse and the proposed anti-tsetse operations between fences north of the Kana River should reduce the challenge from tsetse to these cattle. It is anticipated that the drug treatment already administered will afford protection until the intensified operations begin to have effect.

A Swingfog machine was installed in February at Mzola Gate to remove tsetses from southbound traffic proceeding towards the Kana River area, and in March, two traffic control gates, the Sijarira gates, were established at the junction of the Kamativi-Zambezi and Kariangwe-Zambezi roads to deal with the increased traffic resulting from movement of the Batonka from the Zambezi Valley. On the Binga-Gokwe road, a traffic control point was set up at Manoti, and another at Gwave. Two were erected in the cattle fence and another at Manyande in the game fence. All road traffic entering or leaving the Sebungwe tsetse area now passes through at least one check point.

An aerial spraying campaign was carried out in the Lubu Valley to reduce the tsetse population and with it the threat of human trypanosomiasis as a preliminary to the settlement of the Batonka displaced from the Zambezi Valley. An airstrip was made at Kariangwe, cut out of the Brachystegia woodland. Operations began in May and ended in September. The local tsetse population was greatly reduced and, if settlement proceeds as recommended by the entomologists could be finally eliminated from the area. (See Section 5 (a) "Aerial Spraying".)

Investigations were carried out at Kariangwe by Mr. Lovemore, entomologist, on sampling techniques for assessing the population of *G. pallidipes* and *G. morsitans*. In addition an intensive ecological survey was carried out by him in the Lubu valley to determine a pattern of settlement that would have maximum effect in removing the essential tsetse habitat. Settlement without cattle is proceeding, but the Africans concerned are anxious to bring in their cattle.

To assist in this work two bait oxen have been kept at Kariangwe since November, 1956, under treatment with antrycide prosalt. Despite severe challenge from both *G. morsitans* and *G. pallidipes* they have remained in good condition and have not shown any evidence of trypanosomiasis since treatment began.

(f) **Darwin**

The situation is static. No tsetse or trypanosomiasis were recorded.

(g) **Eastern Districts: Chipinga**

Sixty tsetses were taken in this area. Two male and three female *G. morsitans*, 14 male and 15 female *G. pallidipes*, 19 male and six female *G. brevipalpis* were taken in traps or by man in the Border Clearing, in Portuguese territory.

It is noteworthy that one *G. austeni* female was taken in the Border Clearing. This is the first record for this country.

Four *G. morsitans* males and one female *G. pallidipes* were taken at the Mount Selinda traffic control gate established in April, indicating that here again, sporadic outbreaks of trypanosomiasis on neighbouring farms may be attributable to carried tsetse.

G. morsitans is still appearing in the records in small numbers.

About 3,000 acres of woodland were cleared in the Gwenzi Native Purchase Area as an extension of the main border clearing from Beacons 96 to 100. Regrowth cutting remains a task of this Department, but the local farmers have agreed to assist by leaving paddocks ungrazed where possible so that good fires may be obtained.

Fifty cases of *T. congolense* and 19 of *T. vivax* were recorded from 16 European owned farms, and 18 cases of *T. congolense* were recorded from African owned cattle in the Gwenzi, Emerald and Chisumbanje areas.

(h) **Sabi Valley**

(i) *East Bank.* There has been an extension of *G. morsitans* in this area. It can now be taken at Mahenya's at the junction of the Sabi and Lundi Rivers, and also in greater abundance at Makossa, and on the Dakate and Chipone Rivers.

A fence line and a road have been cut for a distance of 25 miles along the Portuguese Border from Beacons 103 to 106 preparatory to the erection of a game fence. Minor fences have been constructed along the Msaswe and Sabi Rivers to assist in directing traffic through traffic control points.

The Rupembe bush clearing programme was completed. Clearing work is now in progress on the Honde River system to strengthen our defence system in this area.

Cattle in the area have been kept under Antryeide protection throughout the year. The general treatment of cattle with Antryeide has removed a source of information on the distribution of disease and probable presence of tsetse. In order to gain some knowledge of the presence of trypanosomiasis in the area, Mr. Goodier initiated a blood smear survey of donkeys. The blood smears were diagnosed by the Veterinary Officer, Chipinga, who later kindly undertook the collection of the smears. Donkeys are brought to the area from the Bikita District, where tsetses do not occur, and are presumably introduced free of trypanosomiasis. They move about in the area and are subjected to infection when they encounter tsetse.

Blood smears were collected from donkeys in five distinct localities of native settlement, four of which (a, b, c and d) were within the known limits of tsetse distribution in the Sabi area. The fifth area (e) lies outside the known tsetse belt, but cattle in the area occasionally contract trypanosomiasis. These areas are:—

(d) The Murongwezi and Nyamakamba Rivers area.

(b) The Mabee School area.

(a) The Makoho School area.

(c) The Chisuma River, Msaswe River and Hippo Mine area.

(e) Mwangaazi: Mariya and Zamchiya areas.

The diagnosis of the blood smears is given in Table I.

TABLE I: Distribution of Trypanosomiasis in Donkeys, Sabi East Bank.

Area	No. of Smears taken	Infection Rate	Infection				
			T. brucei	*T. congolense*	*T. vivax*	*T. congolense* and *T. vivax*	*T. brucei* and *T. vivax*
(*a*) Makoho School area	18	39%	5	—	1	—	1
(*b*) Mabee School area	76	21%	6	7	2	1	—
(*c*) Chisuma R., Msaswe R., Hippo Mine area	108	5%	2	3	—	—	—
(*d*) Murongwezi R. and Nyamakamba R. area	108	5%	2	3	—	—	—
(*e*) Mwangazi-Mariya Zamchiya area . . .	238	—	—	—	—	—	—
TOTAL	—	—	15	12	3	1	1

It is interesting to note that *T. congolense* and *T. brucei* occur in donkeys far more frequently than does *T. vivax.*

Area (a) which showed the highest infection rate lies adjacent to the Portuguese Border on the Honde River system which is known to carry tsetse. The Makoho traffic control point which inspects traffic proceeding north from this area recorded 106 *G. morsitans* and 30 *G. pallidipes* during the year on northbound traffic. One *G. morsitans* was captured from a donkey as it was being smeared.

Area (b) lies a few miles to the north away from the Honde tributaries. Tsetse have been caught occasionally on the Portuguese border within a short distance of this area. Makoho gate, which receives traffic southbound from the area, recorded 31 *G. morsitans* and 27 *G. pallidipes* on southbound traffic. Northbound traffic from the area which is inspected at Nyamakamba gate, yielded 11 *G. morsitans* and 14 *G. pallidipes.*

Tsetse are known to occur in small numbers in area (c) on the Chisuma River and Lower Msaswe River, and to occur occasionally at Hippo Mine. Traffic from the Hippo Mine area yielded four *G. morsitans* at Msaswe gate. Traffic coming from the Chisuma area would also

include traffic which had passed through the Makossa area where *G. morsitans* occurs in abundance. Catches at this control point are therefore not strictly comparable.

The area (d) is close to the northern limit of tsetse in the Sabi area. No tsetse have been taken on foot patrols. The Nyamakamba gate, which controls traffic moving southwards from the area yielded seven *G. morsitans*.

Area (e) is further still to the north. Cattle are kept here with only occasional infections with trypanosomiasis. No positive smears were found in the donkeys. Hlahla gate, which received traffic northbound and southbound from the area, and Mwangazi gate which receives traffic northbound from the area recorded no tsetse during the year.

There is clearly a relation between the distribution of tsetse as shown by gate records and the distribution of disease. It would thus be possible to predict with some accuracy the incidence of disease in an area from a knowledge of the comparative density of tsetse in other neighbouring areas.

(ii) *West Bank*. Repeated surveys, traffic control records and the incidence of disease have contributed to a better appreciation of the tsetse situation. *G. pallidipes* has been taken at Muwawa, Ndari and Nyachindwe Gates. Ndari Gate recorded 215 *G. morsitans*, Muwawa Gate 63 and Nyachindwe 16.

Trypanosomiasis continued to be recorded from the Ndanga East Reserve. The Rupangwaan cattle showed clinical signs of the disease during November, 1956. As the incidence of disease is usually heaviest in April or May it seemed prudent to forestall a mass infection by taking immediate action. The Veterinary Department undertook general treatment of herds containing suspected cases with Antrycide pro-salt in November. Other herds were treated as the disease appeared in them. No cases have been recorded from these herds after treatment. A system of branding has now been introduced which enables the Veterinary Officer to relate animals to particular dips and to record with accuracy their treatment history.

The present position is that there has been a serious extension in numbers and in distribution of both *G. morsitans* and *G. pallidipes*. Both species have been taken within the Ndanga East Reserve and a breeding area of *G. morsitans* has been detected near Bandai in the south-eastern corner of Ndanga East Reserve. This area approximately five square miles in extent, has been fenced off, and bush clearing operations begun to eliminate the tsetse habitat in *Brachystegia tamarindoides* woodland.

Hunting operations in the fenced area south of the Ndanga East Reserve began on 1st April. The area has been divided into six sections, each containing a hunting camp and readily accessible by road. A supervisor hunter, 12 hunters and two labourers are stationed at each camp. The hunters operate in pairs and work from sunrise to sunset or until an animal is killed, when it is brought back to the camp. Part of the meat is retained by the hunters and the remainder is used as meat ration for other African labour. Hides are collected and sold at Fort Victoria and the revenue is paid to the Game Officer.

Attempts are being made to assess the effect of hunting on the game population by recording spoor on specially prepared strips of ground. It is hoped in this way to be able to assess the decline in population and to manoeuvre our hunters so that they can be used with greatest effect.

3. SURVEY REPORTS

The accumulation of information on the distribution and abundance of *Glossina* continues. It has been possible this year to extend the surveys beyond the limits of the proclaimed tsetse areas, and most valuable information has been obtained.

(a) The Lubu Valley

An ecological survey of the Lubu Valley was undertaken by D. F. Lovemore to form the basis of a resettlement scheme for the Batonka moved from the Zambezi Valley. The Lubu Valley was formerly an endemic sleeping sickness area from which, in 1912, the residents were removed for their own survival, to the Zambezi Valley. The dangers of returning these people to the Lubu Valley were pointed out to the Native Department, at a meeting held in January, 1956, and recommendations for remedial measures were offered. These included reducing the challenge from tsetse by treating the area with insecticide applied from aircraft, and organizing settlement to conform with a pattern to be determined from a survey of the essential tsetse habitat. It transpired that settlement could not await the completion of the aerial spraying programme, or even of the water development of the area.

It is fortunate that these Batonka, without any guidance on these matters, have cultivated only the river alluvium and "sinanga" sands, which form part of the areas that would have been selected by the entomologist for initial settlement.

The survey is nearing completion and the report is awaited.

(b) Survey of the Mtshezu, Senkwe River Areas and Manzituba Vlei

In 1914, Mr. R. W. Jack, Government Entomologist, wrote an account of a visit to the Manzituba vlei, where *G. morsitans* is reported to have persisted after the 1896 rinderpest

epizootic (Jack, R. W., "Tsetse Fly and Big Game in Southern Rhodesia", Bull, ent. Res. V. (2) p. 97, Sept., 1914). Since this account only occasional and brief reports and verbal accounts of the area are available. Few Africans are familiar with the area. As a supplementary exercise to his "Lubu Valley Survey" Mr. Lovemore undertook a survey of the area between the Lubu Valley and Manzituba Vlei. His report, "A Report on a Survey of part of the Mtshezu River and its Valley, the Manzituba Vlei and River Area, some of the Headwaters of the Lubu/Mbelele River, Mucheninga Spring, the Gwababa River where this comes through the Escarpment and the Mbelele Hill/Mbelele River Area", describes the vegetation, game and tsetse, both of *G. morsitans* and *G. pallidipes* in an almost unknown area and gives an interesting account of his itinerary. He makes a strong plea, endorsed by all concerned with the perpetuation of game species in Southern Rhodesia, for the provision of a game sanctuary in the Mbelele-Lubu headwaters area. Unless a game sanctuary is provided the extension of African settlement and with it the inevitable trapping and snaring of game, will undoubtedly lead to the reduction, if not elimination, of a rich fauna in this area. He urges swift action in establishing the area as a game sanctuary.

(c) **Survey of the Eastern Sebungwe**

The repeated occurrence of *G. pallidipes* and the large numbers of *G. morsitans* taken at the Sanyati Gate in the western Urungwe made it desirable to investigate the source of these tsetses. Mr. Goodier undertook a survey of the eastern Sebungwe area, particularly along the Umvumvudzi, Gungunkwe and Bumi river systems to determine the distribution of tsetse. (Goodier R., "A Survey of the Tsetse Situation in the Eastern Sebungwe".)

The survey was supplemented by foot, bicycle and car traverses which yielded quantitative data on the abundance of *G. morsitans*.

The dominant vegetation was mopane woodland which covered the valley floors. The higher ground supported a *Brachystegia* consocies, including *B. boehmii Taub., Julbernardia globiflora* (Benth) Troupin with *Pterocarpus angolensis* D.C. and *Diospyros kirkii Hiern. Julbernardia globiflora* having a wider altitude range, was found on the low hills to the exclusion of *Brachystegia* spp. The alluvium of the river valleys supported *Acacia albida* Del., *Lonchocarpus capassa* Rolfe and *Combretum mossambicense* (Klotzsch) Engl. Along the rivers, as an evergreen riverine fringe, occurred *Diospyros mespiliformis* Hochst., *Trichilia emetica* Vahl., *Kigelia pinnata* D.C., with such shrubs as *Combretum mossambicense* (Klotzsch) Engl. and *Popowia obovata* (Benth) Engl. and Diels.

Tsetse were caught in each vegetation type, but were most abundant in the mopane-riverine fringe ecotone. The southern boundary of *G. morsitans* in the area appears to be from the Ganderowe Falls on the Sanyati River, approximately due south to Massimassu pan and then westwards to Mutimutema Store at the drift across the Sessami River on the Gokwe road. North of this line, *G. morsitans* is distributed generally. *G. pallidipes* was recorded from the Gungunkwe River system near the kraal of Sampakaruma who was recently removed from the Zambezi Valley. This source of *G. pallidipes* may be the origin of this species caught at Sanyati Gate.

(d) **Lutope and Sengwa Rivers**

The persistence of trypanosomiasis in cattle along the Lutope River suggested that tsetse existed in the neighbourhood of that river. Surveys carried out earlier by Mr. D. Rose in 1952 and Mr. K. Boyd in 1953, indicated that *G. morsitans* did not occur on the Lutope River east of its confluence with the Lutotshwana River. Mr. H. C. Brayne surveyed this area during the year, and came to the same conclusion. No *G. morsitans* were found on the Lutope River east of the Lutotshwana River, but it occurred on the southern tributaries of the Sengwa River. The disease in the Lutope cattle is probably attributable to tsetse derived from these rivers, and to the carriage of tsetse by traffic from the Mbungu River. The recently built cattle fence running from the Central road to the north bank of the Lutope River and eastwards along it should break contact between these cattle and the tsetse of the Sengwa River system.

(e) **Western Urungwe**

In order to obtain a complete picture of the tsetse situation in the Western Urungwe, the present distribution of *G. morsitans* in that area was surveyed and summarized from reports of other entomologists by Mr. Goodier. (R. Goodier, "Summary of the Tsetse Situation in the Western Urungwe, Pt. 1".) Fly rounds, car traverses and bait oxen were employed in the search for tsetse. The position now appears to be greatly improved since 1952-53 when quantitative records began.

The southern boundary lies between the Tengwe and Msukwe-Badzi river systems. The heavy fly concentration north of these rivers on the Rengwe area of the Fulechi river system has now been eliminated. The Kadzomba-Tsuwiri area still yields moderately high catches, but bush clearing activities in this area are likely to eliminate this source of tsetse.

Most of the rivers north of the Fulechi carry some tstese, but the only known concentration is in the Kapondo area, in the Native Purchase Area. Unless and until this area is redesignated a Special Native Area, reclamation work in the form of anti-tsetse measures would be futile because the area could not be consolidated by settlement. As a Native Purchase Area, it must await such time as Africans wished to purchase a portion of land infested with tsetse far removed from markets and supplies and on which they could not keep cattle. The utilization of this area depends upon its becoming a Special Native Area.

4. KARIANGWE FIELD STATION

Investigations on the bionomics of *G. morsitans* and *G. pallidipes* have progressed unevenly. Mr. Lovemore became involved with the preliminary surveys required for the aerial spraying campaign, with the construction of the airstrip and latterly with the reorganziation of the administration of the area following the construction of game and cattle fences. Despite these calls on his time and energies, he was able to further his studies on tsetse.

It is of fundamental importance when comparing insect populations, to be certain of the basis of any estimates made. *G. pallidipes* is not readily attracted to man, but is attracted to cattle. It seemed desirable therefore to compare catches made by various methods at the same time over the same territory.

Over the same periods, using humans as an attractant compared with oxen, 15 *G. pallidipes* were taken from humans and 42 from the oxen. Comparing the attractiveness of screens carried by humans with that of bait oxen, it was found that 93 *G. pallidipes* were taken from the bait oxen and 29 from the screens. The average taken by the screen method was rather less than 5.0 compared with 5.0 for humans alone. The screen does not appear to add to the limited attractiveness of humans.

It is worth comment that of the 15 *G. pallidipes* taken on humans, 11 were taken from one particular African.

Catches of *G. pallidipes* carried out throughout the day from sunrise until after sunset, using bait oxen, are given in Table 2. Clearly, in this case, *G. pallidipes* are more available between the hours of 5 and 7 p.m. Time of day and method of capture are thus important factors that must be considered in interpreting records of this species.

Table 2. Catches of *G. pallidipes* on bait oxen throughout the day.

Time of Day	6.05 to 7.25	8.37 to 9.56	11.00 to 12.10	13.45 to 14.50	15.40 to 16.45	17.40 to 19.03
Total catch . . .	5	5	4	0	2	19

Traps set out on a fly round gave the result shown in Table 3. Traps were examined at the times indicated over a period from January 25th to February 11th:

Table 3. Catches of *G. pallidipes* taken from traps during the day.

Time of Day	8.30	10.30	12.30	14.30	16.30	18.30
Total catch	8*	6	0	4	33	8

(*This figure may include flies from previous evening.)

In this case, the period 2.30 p.m. to 4.30 p.m. yielded the highest catch.

Soon after these interesting observations had been made the *G. pallidipes* population in the area broke up and investigations were discontinued.

The aerial spraying operation followed which has apparently eliminated the species from the area. Further searching has now revealed a concentration of *G. pallidipes* beyond the sprayed area and investigations are continuing.

The technique now in use to record population fluctuations of *G. pallidipes* is to employ bait oxen on fly rounds from about 5.0 p.m. until dark. Special precautions have to be taken for protection against the lions that are also attracted by the bait oxen.

Populations studies on *G. morsitans* have shown the importance of the "intermediate sandveld" associes as a permanent habitat for this species, and the significance of the mopane/intermediate sandveld associes contact as a feeding ground. *G. morsitans* was found not to penetrate the "Sinanga" thicket ("jesse" thicket) during the rains or the early dry season, but to concentrate along the thicket edge, especially where the "Sinanga" meets the mopane.

The two bait oxen used in this work were purchased in November, 1956, at Binga's and have been kept in excellent condition at Kariangwe under extremely high challenge from *G. morsitans* and *G. pallidipes*, by six-weekly treatment with antrycide prosalt.

Further collections of blood meals of *G. morsitans* were made by Mr. Lovemore at Kariangwe. A total of 305 were identified at the Lister Institute by Mr. Weitz, with the following result.

Primates—

Man	17	
Monkey	3	
Unidentified	5	
	—	25

Pigs—

Warthog	103	
Bushpig	3	
Unidentified	9	
	—	115

Bovids—		
Kudu	27	
Roan Antelope	2	
Bushbuck	9	
Impala	8	
Buffalo	11	
Eland	5	
Waterbuck	2	
Reedbuck	3	
Duiker	2	
Ox	2	
Kudu or eland	2	
Buffalo or Kudu	1	
Kudu or Bushbuck	2	
Reedbuck or Waterbuck	2	
Unidentified	39	
	—	117
Other Mammals—		
Rhinoceros	3	
Porcupine	10	
Dog	7	
Cat	1	
Cat or Hyaena	2	
Unidentified	19	
	—	42
Birds	6	
	—	6

This list extends the host range of *G. morsitans* known to us and confirms what was suspected that most game animals can provide this species with a source of food. It also shows that for the period over which the collection was made, pigs are as important a source of food as all the Bovids together.

5. CONTROL MEASURES

(a) **Aerial Spraying**

(i) *Kariba.* The aerial spraying operations conducted at Kariba during 1955-56 were concluded at the end of October, 1956. The fly rounds were maintained throughout the year so that the subsequent behaviour of the local tsetse population might be followed. As had been anticipated the population built up rapidly after the conclusion of treatment by migration from the surrounding unsprayed areas. Figures 1, 2 and 3 show the progress recorded on the three fly rounds, Kasese, Chavaru and Nyanyanga, and should be compared with Figures 7, 8 and 9 of my Report for 1955-56.

It is evident that the tsetse population of the sprayed area from the Kasese River eastwards has recovered from the aerial spraying treatment. Fly is absent, however, between the Kasese River and the Kariba township. Some cases of trypanosomiasis have been recorded in dogs, but no cases of human trypanosomiasis have been recorded from the Kariba site or township.

(ii) *Lubu Valley.* The construction of the Kariba dam and the subsequent flooding of the Zambezi Valley have made it necessary to remove the resident African population to areas free from inundation. These people were allowed some freedom of choice in selecting their new homes. Many chose to return to their ancestral homes in the valley above the Zambezi escarpment, where they knew existed pockets of relatively fertile alluvial soils. One site so chosen for settlement was the Lubu Valley System, comprising the Lubu, Dett, Lungwalala and Mtshezu Valleys. This was an area from which the immediate ancestors of these people had been removed after the outbreak of human trypanosomiasis in 1912 (see Blair, D. M., "Human Trypanosomiasis in Southern Rhodesia, 1911-1938", Trans., R. Soc. Trop. Med. Hyg. *32*. 729).

While little is known of the persistence of *Trypanosoma rhodesiense* in game animals and its virulence to man after repeated passage through such animals, sufficient circumstantial evidence existed to suggest that the return of these people to the Lubu Valley, where both *G. morsitans* and *G. pallidipes* occurred in large numbers, could lead to the reappearance of the disease, although the area has been uninhabited by humans since 1913.

At a meeting held in January, 1956, attended by representatives of the Native Department, Veterinary Department, Health Department, Game Department and the Branch of Tsetse Fly Operations, this Department recommended that aerial spraying should be undertaken in the Lubu Valley in order to reduce the known heavy tsetse concentration as a preliminary to the re-introduction of those Batonka people who were to be displaced from their homes in the Zambezi Valley. The threat of the reappearance of human sleeping sickness in the area was sufficiently real to justify the expense of an aerial spraying campaign.

During 1956 Mr. Lovemore prepared a preliminary ecological map of the area showing the distribution of essential tsetse habitat on which operations were based. Provision was made initially to treat 80 square miles of country but as the survey proceeded it became evident that it would be necessary to extend treatment to 100 square miles.

The Lubu Valley area forms a level plain bounded on all sides by escarpment rising to about 800 feet above the valley floor. It includes the valleys of the Lubu, Lungwalala, Mbelele, Dett and Mtshezu Rivers. The soils of the area are mainly derived from sandstone and are of low fertility, but along the river banks there are patches of alluvial soils which support a mixed

evergreen river fringe, and elsewhere small areas of clay soils occur derived from Permian shales. The areas of alluvial and clay soils provide the only localities with agricultural potential, and even here, the incorporation of cattle into an agricultural system would be necessary to achieve anything beyond a mere subsistence farming. The sides of the valleys are generally very rocky and support a sparse vegetation. They are not inhabited by tsetse flies, and, except perhaps during the wet season, provide a barrier to their passage. These hill slopes formed the boundaries of the area under treatment. The vegetation of the valley floor was very mixed, and included mopane, evergreen river fringe and thicket. The wide range of shade conditions provided by this mixture of vegetational types meant that tsetse were widely distributed throughout the area. It was thus necessary in the treatment to cover the whole of this area, approximately 75 square miles, with insecticide. Along the river valleys of the Dett, Mtshezu and Mbelele, where in the dry season tsetses are restricted to the riverine fringe, only the evergreen riverine vegetation was treated—an area totalling about 25 square miles.

The limitations of this "linear" treatment were revealed during the course of the Kariba aerial spraying programme. The concept is sound, but its success depends upon there being a prolonged dry and cold spell of weather to accelerate leaf fall in the woodland surrounding the riverine fringes. An abrupt leaf fall is usually accompanied by a concentration of tsetse along the rivers.

The use of this method here was justified in that it offered the most economical use of aircraft and insecticide in terms of acreage subjected to effective treatment.

The meteorological data relating to this area was limited to that gained by Mr. Lovemore during his one year's stay in 1951, so that weather predictions were uncertain in the extreme. A landing strip was cut out of the *Brachystegia* woodland at Kariangwe. Transport of insecticide was carried out under extreme difficulties since Kariangwe is separated from the nearest railhead by 120 miles of indifferent bush roads crossing two escarpments.

Messrs. Skyworks (Pvt.) Ltd., a local firm of contractors, undertook the application of insecticide. Four Tiger Moth aircraft, powered by Gipsy Major, Series I, engines and each carrying a 50 gallon tank of insecticide, and one Avro XIX aircraft powered by two Cheetah XIX engines, carrying insecticide in two 100 gallon tanks were used. The insecticide used was a four per cent. solution of gamma BHC in diesoline which was introduced into the exhaust stacks of the aircraft by means of electrically driven impeller type pumps to produce the aerosol.

Mr. R. J. Phelps, entomologist, conducted the operations. To him fell the task of standardizing dosage rate and droplet size, of deciding when and where applications of insecticide should be made, and of recording the effect of treatment on the tsetse population. The work involved almost perpetual duty from May when operations began until their conclusion in September. Work began at 4.00 a.m. and ended at about 10.00 p.m. Flying took place on any morning or afternoon when weather conditions permitted.

The Anson aircraft was used to treat the flat areas. It flew at 120 m.p.h. and gave a swathe width estimated at 70 yards. Under these conditions, each engine discharged a gallon of insecticide in 27.6 seconds. The Tiger Moth aircraft were used on the more rugged country and where treatment was applied along the riverine fringes. They flew at about 80 m.p.h. and gave a swathe width of 25 yards. Each aircraft discharged a gallon of insecticide in 62.5 seconds.

Weather conditions were far from ideal. Very strong north-easterly winds were common, seriously restricting the available flying time. A 21-day cycle was selected as a suitable standard for treatment. Owing to adverse weather conditions it was achieved on only one occasion, but the interval between any two successive applications was always less than the critical period indicated by the sum of the duration of the female pupa and the prelarviposition period, except for any flies emerging after the fifth cycle.

In other words, a female larva deposited immediately before an application of insecticide could mature, become adult and mate, but would encounter an application of insecticide before dropping its first larva.

The treatment was sustained for 135 days, which was long enough to cover the pupal period of all pupae deposited before spraying began and even any from females that had survived the first application.

The droplet size of the aerosol was maintained at a mass median diameter of 48 to 59 microns, for all aircraft, and the 50 per cent. number at 18 to 29 microns.

Comparing the actual time flown with the minimum time that would be required to dispense the amount of insecticide used at the rate of one gallon every 62.5 seconds for the Tiger Moths and one gallon every 27.6 seconds for the Anson, it was found that actual spraying occupied only 8.5 per cent. of the time flown by the Tiger Moths and 35 per cent. of the time flown by the Anson. This low standard of efficiency is not a reflection on pilots or ground crews, who exhibited great skill and patience at all times, but is an indication of the difficulty of flying along the narrower river courses, of the time lost in manoeuvring the aircraft after making a spray run, and to some extent shows the limitations of the obsolete types of aircraft used.

The full effect of the operations cannot be assessed until at least a complete season has elapsed. However, the indications are encouraging. Fly rounds set out within the sprayed area show that the tsetse population has suffered a severe set-back. The introduction of a planned settlement based on a pattern recommended by the entomologist could lead to the permanent exclusion of tsetse from this area.

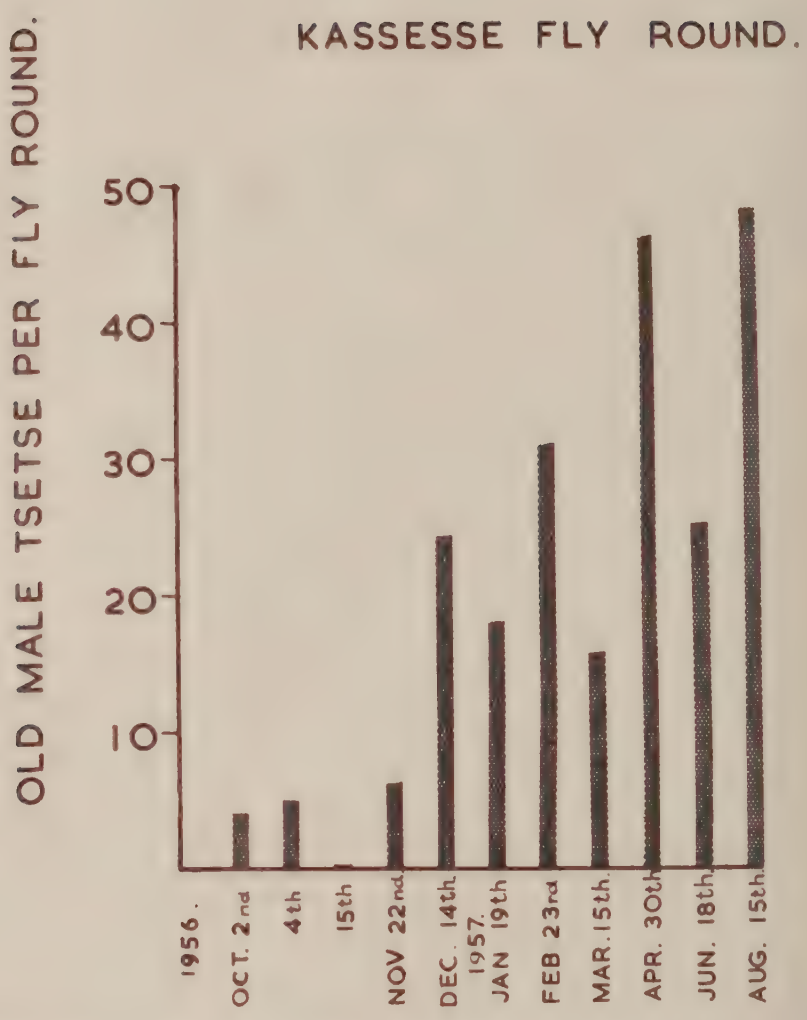

FIG. 1. KARIBA AERIAL SPRAYING : ENTIRE AREA TREATED.

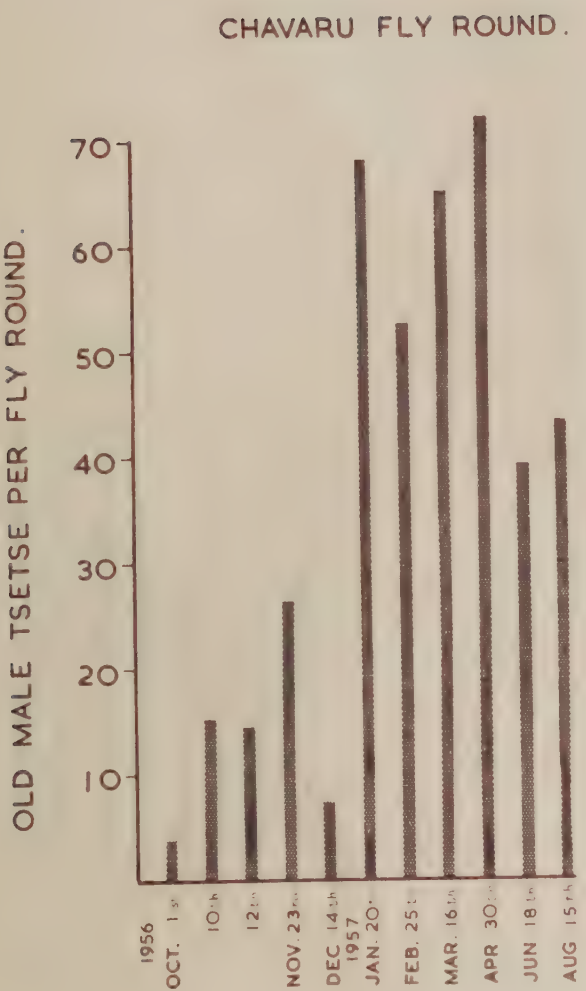

FIG. 2. KARIBA AERIAL SPRAYING :
ONLY RIVERINE VEGETATION TREATED.

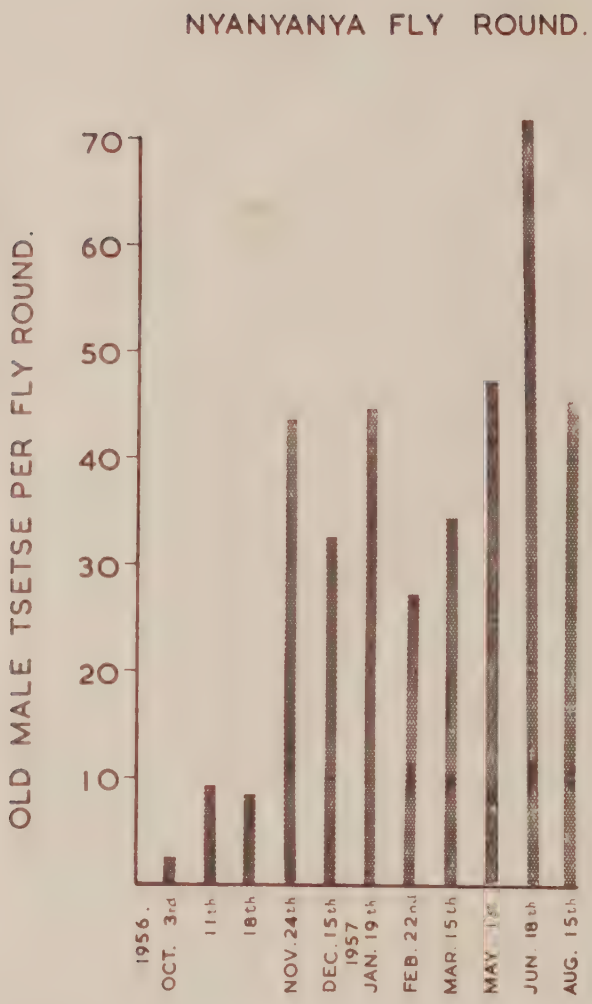

FIG. 3 KARIBA AERIAL SPRAYING :
ONLY RIVERINE VEGETATION TREATED.

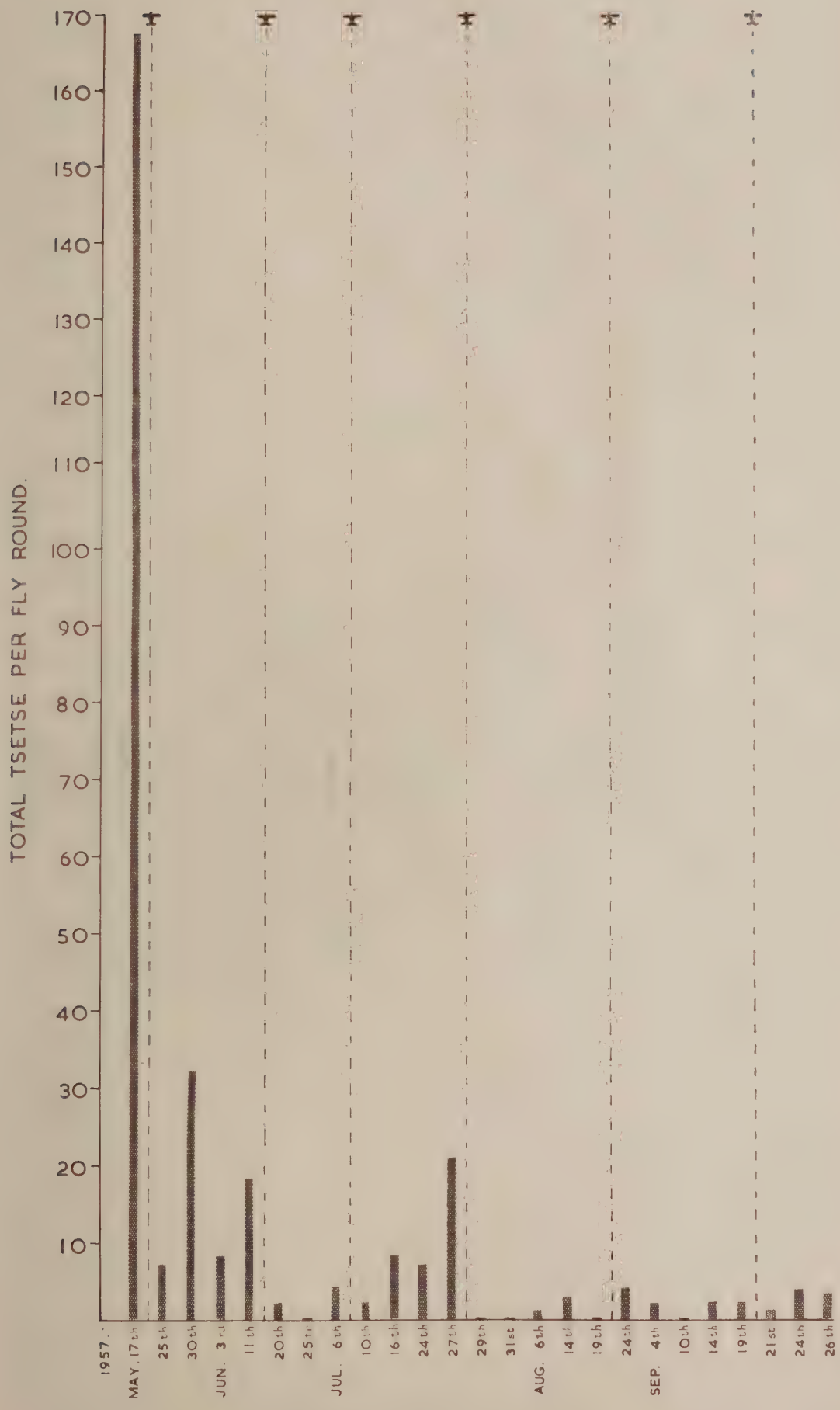

FIG 4 TOTAL CATCH : LUNGWALALA FLY ROUND.

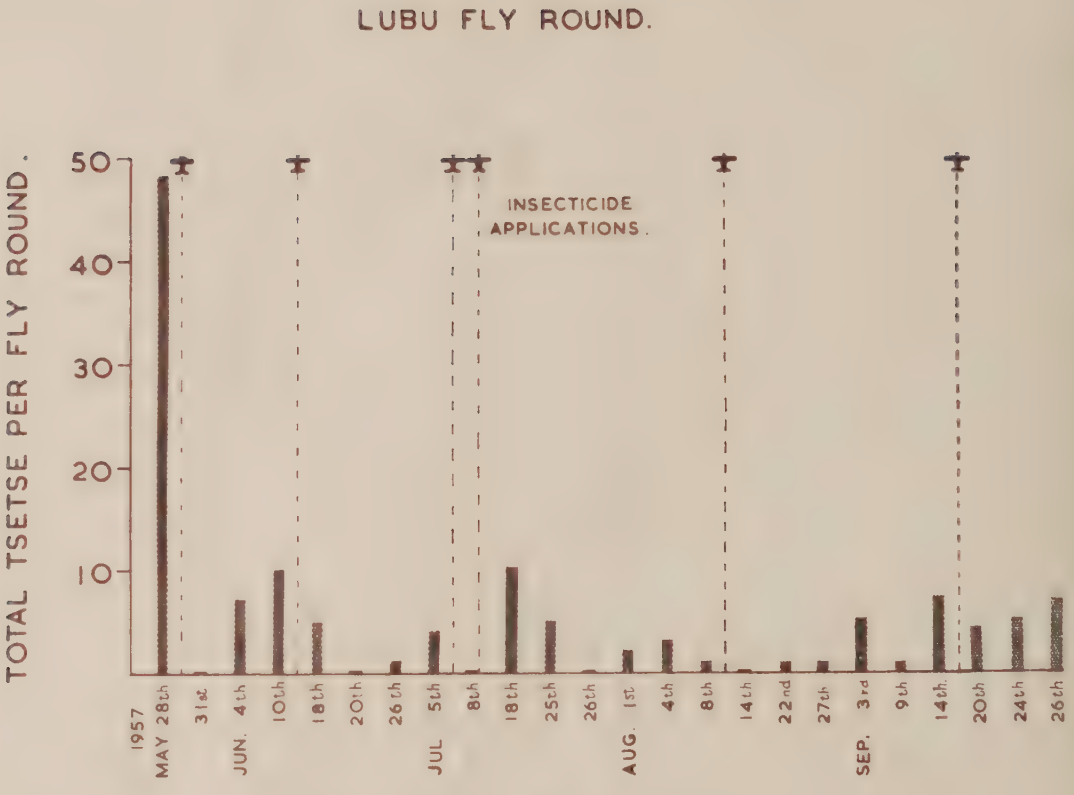

FIG. 5. TOTAL CATCH : LUBU FLY ROUND.

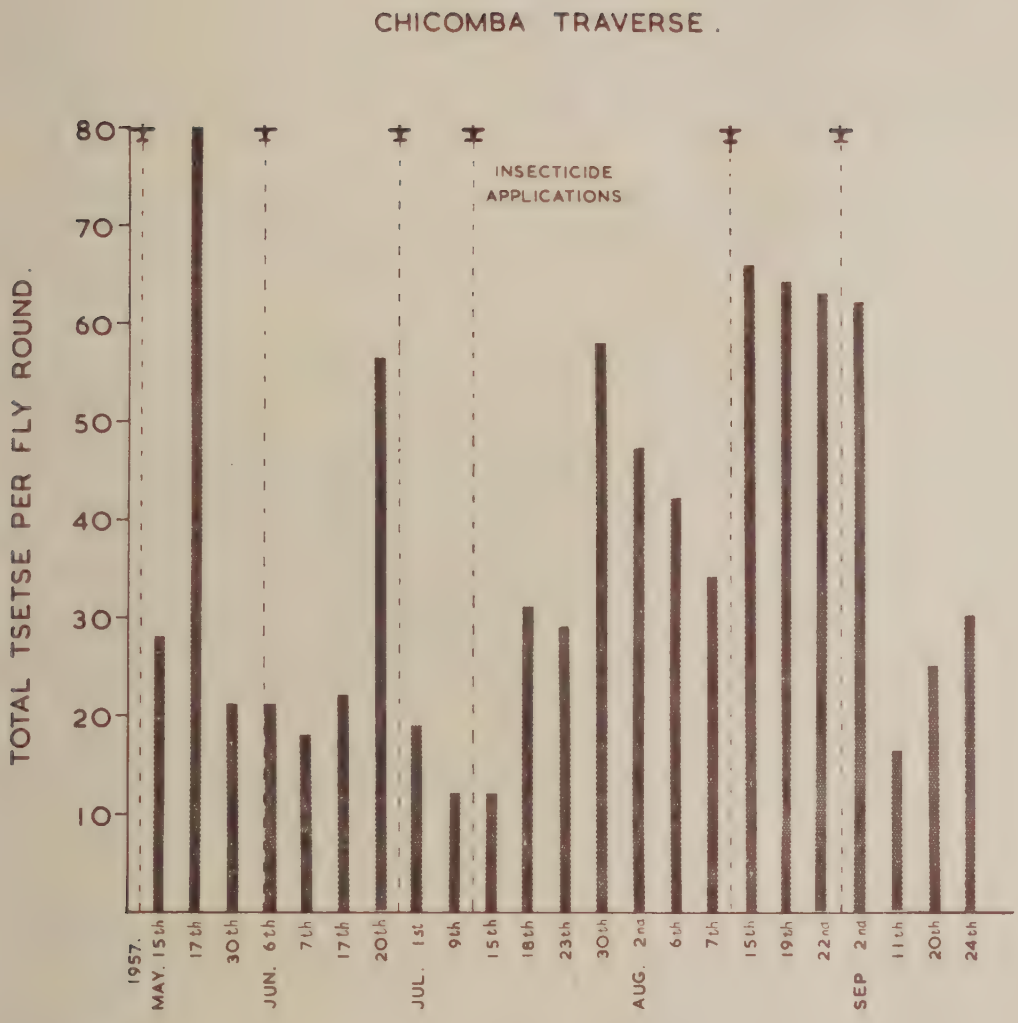

FIG. 6 TOTAL CATCH : CHICOMBA TRAVERSE.

Figures 4-6 show the results obtained from the various fly rounds. Treatment to the valley floor has been effective but the Chicomba vlei traverse shows that "Linear" treatment cannot be relied upon to give satisfactory kills between May and September.

The cost of the operations for the six applications was 14.22 shillings per acre, including the cost of insecticide and hire of aircraft, which is rather less than half the cost of the aerial spraying operations carried out at Kariba. (Ten application were used at Kariba, and the smaller area covered meant less economic use of flying time.)

(b) **Use of Fences**

Further progress has been made in erecting fences as a means of preventing the ingress of game to our areas of operations. It has been found that the fences suffer damage early in their history, particularly where the indigenous people harry the game, but after a few months, damage becomes far less frequent. Animals have been observed to move up to the fences, inspect them, and then move away.

The game fences now being erected are accompanied by negotiable roads, so that frequent inspections can be made and any necessary repairs expeditiously carried out. On the Sabi West Bank, African orderlies on cycles each patrol 20 miles of fence a day, inspecting the entire fence daily. Notes are made of breaks and the numbers and kinds of animals involved. Certain sections are used to record the passage of game by noting the tracks made on cleared and carefully raked ground.

(i) *The Sabi West Bank Fence System.* The game fence running for 78 miles from the Nyamasikana (Ramisikana) River south of the Lundi River northwards to the Sabi at a point about five miles north of the northerly beacon of the Sangwe Reserve was completed late in September.

It appeared to be fortunate at the time that the portion of the fence south of the Mkwasine River had been completed while most of the game animals, including elephant, had moved westwards out of our area of operations, and that there would be relatively few game left to be killed.

However, game movements from west to east during early September, apparently connected with water scarcity, caused large herds of zebra, and some buffalo to be confronted with the partly erected game fence in the region of the Mkwasine River. The animals were held up in their eastward movement for about two weeks, during which time some 300 zebra, six buffalo and one eland died near the fence. Other game, including elephant, eland, impala and buffalo had been reported as visiting the fence and returning westwards or moving southwards to water sources on the Chiredzi or Lundi rivers.

Many of the animals eventually found their way to the east of the fence either around or through the incompleted section of the fence north of the Mkwasine. The presence of these additional animals within our area of operations where little game destruction would have been necessary is most disappointing.

The factors which led to the deaths of the zebra are not fully understood. In drought years in the semi-arid regions of Southern Rhodesia, many game animals and native owned stock die, primarily of thirst. However, after the concentration west of the fence had dispersed, several instances were recorded of zebra being found dead near waterholes both east and west of the fence. Furthermore, instances were subsequently recorded of zebra being found dead elsewhere in the southern low veld, some of them near to available water.

Much public emotion was engendered by Press representation of these events. Societies concerned with the well being of animals (mainly birds and mammals) were particularly distressed. Several Press meetings were held, attended by the Minister of Mines, Lands and Surveys (responsible for game in Southern Rhodesia), the Chairman of the Trypanosomiasis Committee and the Acting Director of the Tsetse and Trypanosomiasis Control and Reclamation Department and Government Public Relations Officers to present informed accounts of the problem and to report progress in ameliorating the plight of the animals.

During this period, the Trypanosomiasis Committee remained adamant in its view that as the fence was intended to serve as a barrier to the passage of animals from tsetse-free ranching areas to tsetse infested areas adjacent to the Sabi River and their return, it should not be broken or removed. This decision was based upon the realization that if the migratory habit of these particular animals were allowed to persist, the series of events which led to the deaths of the 300 zebra could recur almost annually in this notoriously poorly watered area. The Committee considered that if the fence remained intact, and the migratory habit of these animals were broken, even at the cost of some hundreds of zebra, there would be a greater saving of animals from destruction in the anti-tsetse measures carried out east of the fence.

The continued appearance of trypanosomiasis in the Ndanga East Reserve cattle called for vigorous action. A game fence was constructed to run from the Sabi River westwards along the Murondozi River to the main North-South game fence. This fence effectively cut off the area in the south known to be infested with *G. morsitans* and *G. pallidipes* from the Ndanga East Reserve. It prevented the movement of Ndanga East cattle into known fly infested areas and restricted the wandering of the native population who could, and undoubtedly did, serve as vehicles

for the carriage of the tsetse. All traffic to and from the Reserve was examined for the presence of tsetse at Ndari Gate in the fence.

Later in the year, as surveys proceeded, one female and a teneral male *G. morsitans* were taken near Bandai, within the Reserve, which indicated that the species had become established in that area.

A fence was erected to cut this area, about five square miles, off from the remainder of the Reserve. Bush clearing operations are to be carried out within this area to make it uninhabitable to tsetse. The clearing operations should result in a marked improvement in the grazing potential of the area.

At the same time, the Native Department agreed to fence the western boundary of the Ndanga East and Sangwe Reserves as a further protection to the cattle of these reserves.

(ii) *The Sabi East Fence.* A line and a road were cut as preparation for the erection of a game fence to run from Beacons 103 to 106. Part of the material intended for this fence was diverted to the west bank fence system.

Minor fences were built to direct traffic, particularly pedestrians, through our traffic control points.

(iii) *The Sebungwe Fence System.* About 100 miles of game fence were built in the Sebungwe District (now Binga and Gokwe Districts), running from the Mlibizi River in the west to a point on the Sengwa River north of Ngomeni in the east. It was found that the cost of materials and erection was below the price quoted by a contractor for erection only.

The work of sinking holes for the poles was greatly assisted in the early stages by the use of a tractor with a post hole digging attachment. However, as the dry season progressed and as rocky soils were encountered, resort had to be made to manual labour aided by steel jumpers.

Some 32 miles of cattle fence were erected to extend the existing cattle fence eastwards along the Lutope River towards Lufosi Dip. This fence is intended to prevent cattle movements into known tsetse areas. It also serves as the southern boundary of our shooting operations in the Sebungwe district.

(iv) *The Urungwe Fence System.* It was anticipated that when the Kariba Lake came into existence there would be a movement of game away from the Zambezi Valley, across the Urungwe Reserve towards the Karoi and Miami farming areas. Such a movement would put further strain on our diminished hunter strength in that area and would endanger the gains we have already made.

So that such a game movement would be diverted a game fence will be built to run from the Sanyati River, in a north-easterly direction towards the Angwa River. Hunting operations would be conducted south of this fence thereby greatly reducing the present operational area.

All other fences were maintained in satisfactory condition.

(c) Game Destruction

The change of emphasis on game destruction as a means of combating tsetse, foreshadowed in my Report for 1955-56, has become more apparent.

During the year under review, 18,003 animals were destroyed for an expenditure of 44,224 rounds of ammunition, giving an average of 2.47 rounds per animal shot. Compared with previous years, Table 4, this average indicated an improvement in marksmanship, consistent with the more careful selection of the hunters and improved control over their activities. It can be expected, however, that as hunting between fences proceeds, and game in these areas become wary and scarce, the average number of rounds used per animal will increase.

Table 4. Relationship between game destroyed and consumption of ammunition.

Year	*No. of Animals Destroyed*	*No. of rounds used*	*Average No. of rounds per animal*
1953–54	36,910	95,999	2·60
1954–55	41,376	107,401	2·58
1955–56	34,208	101,275	2·96
1956–57	18,003	44,224	2·47

An analysis of the game destroyed is given in Table 5 which shows that the smaller game and carnivores amounted to 74.5 per cent. of the total.

Table 5. Total of all game killed in anti-tsetse operations. 1st October, 1956 - 30th September, 1957.

Larger Game		*Small Game and Carnivora*	
Elephant	93	Duiker	6,310
Rhinoceros	—	Klipspringer	1
Zebra	133	Oribi	44
Buffalo	118	Steenbok	1
Hartebeest	7	Bushpig	1,288
Tsessebe	4	Warthog	3,091
Waterbuck	81	Baboon	2,619
Reedbuck	164	Wild Dog	16
Sable	430	Hyaena	25
Roan	55	Cheetah	1
Eland	82	Leopard	11
Kudu	1,816		
Bushbuck	1,172		
Impala	440		
Wildebeeste	1		
	4,596		13,407

Larger game	4,596
Small game and Carnivora	13,407
	18,003

The reduction in the number of animals destroyed is the direct result of restricting the area of operations and of withholding hunting operations in areas where fence construction was in progress.

Hunting operations in the "Chirundu Strip" terminated in November, 1956, and in the Sebungwe area were suspended in February, 1957, to enable fence building operations to proceed at maximum speed. They were carried out throughout the year in the Mtoko, Darwin and Sipolilo (Zambezi Valley), Urungwe, S.W. Lomagundi and Sabi East areas. Hunting began in the Sabi West area on 1st April.

The elephants enclosed by the Sebungwe fence presented a special problem. They threatened the existence of the fence: they were a danger and a nuisance to the settled areas south of the cattle fence, and they presented the threat to the Wankie Game Reserve of introducing tsetse and also of overpopulating with elephants an already densely populated area.

By special arrangement with the Minister of Mines, Lands and Surveys, a combined operation was planned, involving selected experienced officers of this Department, of the Wankie Game Reserve and of the Game Department, under the direction of the Game Officer to remove elephant from the fenced area and the area known as the Gwaai "Corridor". Officers of this Department did not operate outside the fenced area.

All elephant killed in hunting operations were shot by European officers. During the year the system of paying Field Officers £10 for killing an elephant was abolished. No employee of this Department has now any direct financial interest in killing animals.

(d) **Bush Clearing**

(i) *Rengwe River System.* Surveys carried out by Senior Field Officer Arnold west of Zemaiwe Gate to find the sources of the tsetse taken at that gate revealed a concentration of *G. morsitans* on the Rengwe river system. Mr. Phelps, entomologist, made an appraisal of the situation and submitted recommendations for a bush clearing scheme designed to remove the essential habitat of the tsetse (R. J. Phelps, "Anti Tsetse Measures in the Rengwe River Area", 1431/3B/7 of 3/4/57).

On Mr. Phelps' transfer to Sebungwe in April to supervise aerial spraying operations, Mr. Goodier, entomologist, undertook the direction of bush clearing operations, and the recording of the behaviour of the tsetse population under the changing conditions imposed upon it. (R. Goodier, "A Preliminary Report on the Rengwe Valley Reclamation Scheme, October, 1957".)

The clearing operations began in May and were completed by the end of August. About 80 acres of riverine vegetation were cut out, at a cost of £430 in labour, or £5 7s. 6d. per acre cleared. The effect of this operation, provided the subsequent settlement of Africans is well organized, will extend at least to the Rengwe and Futu Valleys which occupy approximately seven square miles. The cost related to the area protected from tsetse is thus eleven shillings per acre.

Tables 6 and 7 show the total numbers and Apparent Densities of *G. morsitans* (measured as the number of old males taken per 10,000 yards of traverse) caught on fly rounds in the cleared area compared with those of a similarly situated uncleared area throughout the period of operations:—

Table 6. Catches of *G. morsitans* on the Rengwe Fly Round in the cleared area.

Date		Catch					
		Old males	Old females	Young males	Young females	Total	Apparent Density.
1957							
May	7th	14	1	—	4	19	70
	10th	3	—	—	—	3	15
	15th	2	1	1	1	5	10
June	6th	6	1	1	—	8	30
	11th	5	1	—	—	6	25
	17th	2	1	1	—	4	10
	25th	—	—	—	—	—	0
	27th	3	3	—	—	6	15
July	3rd	—	1	—	—	1	0
	11th	1	—	—	—	1	5
	15th	—	1	—	—	1	0
	22nd	—	—	—	—	—	0
August	13th	2	—	—	—	2	10
	16th	—	—	—	—	—	—
	21st	—	—	—	—	—	—
	24th	—	—	1	—	1	0

Table 7. Catches of *G. morsitans* on the Kadzomba-Tsuwiri Fly Round in an uncleared area.

Date		Catch					
		Old males	Old females	Young males	Young females	Total	Apparent Density
1957							
May	9th	6	3	—	2	11	30
	19th	4	1	—	—	5	20
June	12th	7	2	1	—	10	35
	16th	2	2	1	—	5	10
July	12th	3	4	1	1	9	15
	19th	8	3	1	—	12	40
August	13th	5	2	2	—	9	25
	22nd	2	—	—	—	2	10
September	20th	8	3	1	—	12	40
October	8th	6	1	—	—	7	30
	22nd	9	2	1	1	13	45
	24th	9	1	—	—	10	36

It is apparent that the fly population of the cleared area has broken down. There had, however, been a very marked drop in the apparent density of the Rengwe Fly Round prior to clearing operations. The catch during March yielded an A.D. of 305 and in April A.D.'s of 110 and 30 were recorded. This drop in numbers may be a seasonal event in this area, but in the absence of quantitative data, this point cannot be decided. It is known, however, that this "pocket" of *G. morsitans* has persisted for several years.

Temperature records kept during July (Table 8) suggested that the removal of the vegetation increased the daily range of temperature from an average of 40.2°F. to 49°F. and that temperatures as low as 32°F. were reached on occasions in the cleared areas.

Table 8. Maximum and Minimum temperatures recorded in cleared and uncleared areas.

Date	July	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th
Cleared area	Max. °F	86	85	85	83	82	80	84	84	85	97	85	85	82
	Min. °F	38	38	38	37	34	35	32	32	33	36	34	34	34
Uncleared area	Max. °F	80	82	82	81	80	72	80	80	82	85	83	83	79
	Min. °F	43	43	43	42	40	40	38	37	38	41	40	40	39

Mean range: Cleared area 49°F. Uncleared area 40.2°F.

It is not likely that *G. morsitans* would find the maximum recorded temperatures intolerable since it is frequently abundant in areas where such temperatures are exceeded. It is more probable that the minimum temperatures recorded reached the limit of tolerance for this species. This problem of tolerance of tsetse for lower temperatures deserves critical investigation.

Bush clearing activities in the Sabi Valley and Chipinga areas have already received comment.

6. TRAFFIC CONTROL

Additional traffic control points have been established in the Sebungwe and Sabi areas.

In anticipation of the increase in traffic as a result of the movement of the Batonka from the Zambezi Valley, a traffic control point was established near Manjolo, called the Sijarira Gates. This controls traffic to and from Kariangwe, Manjolo and Kamativi.

The opening of the road from Siabuwa to Gokwe and the increase in traffic along this road made it necessary to establish a temporary traffic control point north of Gokwe. This gate has now been finally sited and will be known as Manoti gate.

At Mzola on the Siambola-Kana road Swingfog machines were installed to cleanse south-bound traffic of tsetse.

A new gate was erected at Nyamakamba, seven miles north of Makoho on the east bank of the Sabi, to replace the Mariya gate, and another was established at Mount Selinda.

There has been a remarkable increase in the records of *G. pallidipes*. Last year 30 specimens were taken from all gates. This year 128 were taken. Three of the four new gates have recorded this species, which indicates that we are becoming more able to predict where the species may be found.

There has been a marked increase in the numbers of *G. morsitans* taken at the Mtoko, Sebungwe and Sabi Gates. At Chirundu and Nyakasanga in the Zambezi Valley there has been an increase, but in the Urungwe Reserve gates the numbers have shown a progressive decline throughout the year.

Appendices 1-6 give the records for all gates.

7. ROADS

About 1,400 miles of bush roads were maintained in a condition suitable for five ton and four wheel drive vehicles and rather more than 300 miles of new roads were cut. The primitive road making equipment available to the Department does not permit of the construction of anything but rough tracks. There can be no doubt that the vehicles hired by this Department and also the private vehicles used by the staff on official business receive extremely hard wear. There is a strong case for a preferential milage allowance for the staff when the normal working conditions of these vehicles are compared with those which use highroads, T.M.B. or farm roads.

8. HUMAN TRYPANOSOMIASIS

Only three cases of human trypanosomiasis were recorded this year, with no deaths; two were Africans and one European. It is probable that the infections were contracted in the Zambezi Valley between Kariba and the Chirundu Sugar Estates. This is the lowest recorded incidence of human trypanosomiasis for many years.

9. ACKNOWLEDGMENTS

I have pleasure in acknowledging the help given to this Department by the staffs of other Departments, particularly the Native Commissioners and Veterinary Officers, and I record with thanks the loyal co-operation of all members of the staff during a strenuous year.

G. F. COCKBILL,
Acting Director.

	EAST BOUND										WEST BOUND										Grand Total
	Cars				Cyclists				Foot			Cars				Cyclists			Foot			
	No.	Tsetse			No.	Tsetse			No.	Tsetse		Total	No.	Tsetse			No.	Tsetse			Total	
		M	F	T		M	F	T		M	F	T			M	F	T			M	F	T		
Badze Stile K.49	0	—	—	—	6,026	—	—	—	6,006	—	—	—	—	0	—	—	—	6,106	—	—	—	6,016	—	—	—	—	—
East Fence: Magunge Chamber	3,988	—	—	—	3,252	—	—	—	2,395	—	—	—	—	3,809	—	—	—	3,200	—	—	—	2,410	—	—	—	—	—
Central Fence: Karambanzungu Gate	242	—	—	—	1,627	*m* 1	1	2	1,746	4	1	5	7	240	—	—	—	1,445	—	—	—	1,653	—	—	—	—	7
Central Fence: Cheoka Gate	819	—	1	1	1,604	2	2	4	1,418	1	1	2	7	791	—	—	—	1,649	—	—	—	1,418	—	—	—	—	7
Central Fence: Badze Gate	2,021	2	—	2	1,658	1	—	1	610	—	—	—	3	1,759	1	—	1	1,686	—	—	—	609	—	—	—	1	4
Central Fence: Tengwe Gate	464	—	—	—	2,779	—	—	—	2,918	—	—	—	—	452	—	—	—	2,734	—	—	—	3,011	—	—	—	—	—
Western Fence: Chiroti Gate	661	18	21	39	1,433	57	6	63	1,049	32	19	51	153	635	2 unsexed 19	7	28	1,346	16	11	27	1,005	16	11	27	82	235
Western Fence: Zemaiwe Gate	738	1 unsexed 2	3	6	779	3 unsexed 44	21	68	734	—	—	—	74	748	—	—	—	744	—	—	—	728	—	—	—	—	74
Western Fence: Kawaya Gate	85	—	—	—	2,194	—	—	—	1,574	—	—	—	—	89	—	—	—	2,376	—	—	—	1,549	—	—	—	—	—
	SOUTH BOUND												NORTH BOUND														
North Fence: Nzoe Gate	170	2	1	3	1,506	8	3	11	1,977	5	1	6	20	152	—	—	—	1,471	—	—	—	1,902	—	1	1	1	21
	EAST BOUND												WEST BOUND														
Sanyati Gate	83	*m* 39	15	54	555	140	71	211	838	124	78	202	467	67	41	22	63	634	177	100	277	806	178	85	263	603	*m* 1,070
		p				1	3	4		3	—	3	7						1 1 unsexed		2		1	—	1	3	*p* 10

m — *G. morsitans.* *p* — *G. pallidipes.*

	EAST BOUND									WEST BOUND										Grand Total
	Cars			Cyclists			Foot				Cars			Cyclists			Foot			
	No.	Tsetse			No.	Tsetse			No.	Tsetse		Total	No.	Tsetse			No.	Tsetse			Total	
		M	F	T		M	F	T		M	F	T			M	F	T		M	F	T		
Catkin Chamber	369	*m* 1	1	2	2,155	4	2	6	2,009	1	—	1	9	365	—	—	—	2,104	—	—	—	2,068	—	—	—	—	9
		p —	1	1		—	—	—		—	—	—	1		—	—	—		—	—	—		—	—	—	—	1
Nyakasanga Gate	9,513	*m* 92	111	203	1,197	103	75	178	1,248	91	97	188	569	8,553	4	8	12	1,223	9	9	18	1,227	8	9	17	47	616
		p —	—	—		—	—	—		—	—	—	—		—	—	—		—	—	—		—	—	—	—	

	NORTH BOUND									SOUTH BOUND										
Chirundu Gate	16,575	*m* 339	232	571	2,902	339	254	593	2,957	295	223	518	1,682	17,115	—	—	—	2,908	—	—	—	3,288	—	—	—	—	1,682
		p —	—	—		—	—	—		—	1	1	1		—	—	—		—	—	—		—	—	—	—	1
Makuti Gate	19,234	*m* —	—	—	2,071	—	—	—	2,210	1	—	1	1	22,744	24	65	89	2,173	31	17	48	2,218	28	21	49	186	187
		p —	—	—		—	—	—		—	—	—	—		2	2	4		—	1	1		—	—	—	5	5
Vuti Chamber	18,018	*m* —	—	—	1,975	—	—	—	1,950	—	—	—	—	22,948	31	41	72	2,076	1	—	1	1,960	1	1	2	75	75
		p —	—	—		—	—	—		—	—	—	—		—	1	1		—	—	—		—	—	—	1	1

m — *G. morsitans.* *p* — *G. pallidipes.*

TRAFFIC CONTROL—MTOKO DISTRICT: 1st OCTOBER, 1956 - 30th SEPTEMBER, 1957 *APPENDIX III*

	EAST BOUND										WEST BOUND										Grand Total
	Cars				Cyclists				Foot			Cars				Cyclists				Foot				
	No.	Tsetse			No.	Tsetse			No.	Tsetse		Total	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	
		M	F	T		M	F	T		M	F	T			M	F	T		M	F	T		M	F	T		
Sutskwe Chamber .	3,890	—	—	—	441	—	—	—	205	—	—	—	—	3,410	5	—	5	473	—	—	—	195	—	—	—	5	5
Border Gate . . .	3,315	25	23	48	22	4	3	7	48	3	1	4	59	2,851	59	69	128	4	1	3	4	78	5	2	7	139	198
Makaha Chamber .	973	—	—	—	1,950	1	2	3	2,238	1	1	2	5	969	2	2	4	2,087	9	4	13	2,167	1	1	2	19	24
	NORTH BOUND											SOUTH BOUND															
Mkota Gate . . .	405	—	—	—	861	—	—	—	1,257	—	—	—	—	461	1	2	3	799	—	—	—	2,363	1	1	2	5	5

	EAST BOUND											WEST BOUND												GRAND TOTAL
	CARS				CYCLISTS				FOOT				CARS				CYCLISTS				FOOT				
	No.	TSETSE			No.	TSETSE			No.	TSETSE		TOTAL	No.	TSETSE			No.	TSETSE			No.	TSETSE		TOTAL	
		M	F	T		M	F	T		M	F	T		M	F	T		M	F	T		M	F	T		
Dongamusi Gate .	16	*m* —	—	—	605	2	9	11	687	4	7	11	22	21			655	12	9	21	590	1	2	3	24	46
Siambola Gate . . (to 28.2.57)	199	*m* 21	35	56	40	10	4	14	292	7	5	12	82	261	243	191	434	195	196	63	259	882	58	12	70	763	845
	FROM NORTH													FROM CIWALI												
Siambola Gate . . (from 1.3.57)	313	*m* 77	81	158	64	92	34	126	77	19	7	26	310	317	26	27	53	33	22	7	29	36	1	1	2	84	394
	FROM LUBIMBI													FROM EAST GAME FENCE												
Siambola Gate . . (from 1.3.57)	244	*m* 11	7	18	125	30	12	42	90	11	5	16	76	105	83	32	115	48	60	12	72	11	3	3	6	193	269
	FROM WEST GAME FENCE																									
Siambola Gate . . (from 1.3.57)	104	*m* 23	18	41	150	31	11	42	470	40	17	57	140													140
Store Gate . . .	408	*m* —	2	2	261	2	4	6	403	—	2	2	10	525	1	—	1	102	4	—	4	191	1	—	1	6	16
	NORTH BOUND													SOUTH BOUND												
Kana Gate . . .	144	*m* —	—	—	1,930	—	—	—	5,879	1	—	1	1	167	—	—	—	2,059	2	3	5	6,774	3	—	3	8	9
Borehole 60 . . .	26	*m* —	1	1	656	2	—	2	1,318	—	—	—	3	21	-	—		649	11	2	13	1,268	2	1	3	16	19
Mzola Gate . . .	541	*m* 2	2	4	382	4	2	6	515	4	2	6	16	457	48	46	94	419	89	57	146	563	52	27	79	319	335
Lubimbi Gate . .	424	*m* —	—	—	315	—	1	1	1,546	—	—	—	1	432	5	1	6	341	20	5	25	1,608	6	3	9	40	41
Store Gate . . .	68	*m* —	—	—	1,533	—	—	—	1,320	—	1	1	1	140	—	1	1	1,764	21	13	34	1,466	2	4	6	41	42
Mbungu/Sefula Gate	102	*m* 4	2	6	418	22	20	42	323	7	2	9	57	126	27	14	41	595	238	57	295	321	40	23	63	399	456

m — *G. morsitans.* *p* — *G. pallidipes.*

	EAST BOUND									WEST BOUND										GRAND TOTAL
	CARS			CYCLISTS			FOOT				CARS			CYCLISTS			FOOT				
	No.	TSETSE		No.	TSETSE		No.	TSETSE		TOTAL	No.	TSETSE		No.	TSETSE		No.	TSETSE		TOTAL	
		M	F T		M	F T		M	F T			M	F T		M	F T		M	F T		
Rusungwe Gate .	16	*m* —	— —	205	7	11 18	2,121	29	17 46	64	29	7	3 10	242	190	96 286	2,202	246	182 428	724	788
		p													2	— 2			1 1	3	*p* 3
Makaro Gate . .	14	*m* 2	3 5	347	53	39 92	1,626	99	85 184	281	17	44	50 94	306	479	188 667	1,834	502	288 790	1,551	1832
		p													1	1				1	*p* 1
Msaswe Gate . .	469	*m* —	— —	981	—	— —	2,884	2	2 4	4	445	17	12 29	1,122	45	51 96	3,161	17	9 26	151	155
		p										1	1 2		2	— 2				4	4
Mwangasi 3 . . . (to 31.3.57)	47	*m* —	— —	2,344	—	— —	9,390	—	— —	—	70	—	— —	2,674	—	— —	8,892	—	— —	—	—
Mutumwa Gate . . (from 1.4.57)	12	*m* —	— —	2,140	—	— —	8,162	—	— —	—	14	—	— —	2,458	—	— —	9,885	—	— —	—	—
Hlahla Gate . . .	139	*m* —	— —	1,057	—	— —	4,022	—	— —	—	134	—	— —	1,227	—	— —	4,776	—	— —	—	—
	SOUTH BOUND									WEST BOUND											
Mwangasi 1 . . . (to 30.4.57)	98	*m* —	— —	268	—	— —	413	—	— —	—	99	—	— —	230	—	— —	428	—	— —	—	—
	NORTH BOUND									SOUTH BOUND											
Mwangasi 2 . . . (to 30.4.57)	267	*m* —	— —	1,359	—	— —	1,521	—	— —	—	301	—	— —	1,324	—	— —	1,550	—	— —	—	
Makoho Gate . .	323	*m* 4	6 10	2,262	30	21 51	4,933	27	18 45	106	293	1	1 2	2,348	11	9 20	5,219	6	3 9	31	137
		p	1 1		10	7 17		10	2 12	30		2	5 7		8	3 11		4	5 9	27	57
Chahwete Gate . .	465	*m* 1	— 1	3,975	—	— —	6,511	—	— —	1	423	—	— —	4,171	—	— —	6,485	—	— —	—	1
Nyamkamba Gate .	195	*m* 2	2 4	1,341	3	1 4	5,639	1	2 3	11	197	—	— —	1,350	3	— 3	5,244	3	1 4	7	18
		p —	3 3		3	2 5		4	2 6	14											14
Mt. Selinda Gate .	631	*m* 4	— 4	1,102	—	— —	332	—	— —	4	723	—	— —	1,171	—	— —	293	—	— —	—	4
		p 1	— 1							1											1

m — *G. morsitans.* *p* — *G. pallidipes.*

	EAST BOUND									WEST BOUND										Grand Total
	Cars			Cyclists			Foot			Cars			Cyclists			Foot				
	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	No.	Tsetse			No.	Tsetse			Total	
		M	F	T		M	F	T		M	F	T			M	F	T		M	F	T		
Muwawa Gate . .	55	*m* —	—	—	1,138	5	1	6	3,084	5	—	5	11	54	—	—	—	1,228	10	3	13	2,579	23	16	39	52	63
		p —	—	—		1	—	1					1		—	—	—		1	1	2		3	2	5	7	8
Artesia Gate . . .	313	—	—	—	1,989	—	—	—	3,220	—	—	—	—	354	—	—	—	1,896	—	—	—	3,618	—	—	—	—	—

	NORTH BOUND									SOUTH BOUND										
Ndari Gate . . .	160	*m* 2	2	4	1,050	72	24	96	2,375	83	28	111	211	188	—	—	—	1,008	1	—	1	2,406	3	—	3	4	215
		p				1	2	3		2	5	7	10										1	—	1	1	11
Nyachindwe Gate .	218	*m* 1	—	1	1,481	9	1	10	2,469	4	—	4	15	257	—	—	—	1,000	1	—	1	2,599	—	—	—	1	16
		p —	—	—			1	1		2	—	2	3														3

m — *G. morsitans.* *p* — *G. pallidipes.*